

# AVIATION WEEK

A MCGRAW-HILL  
PUBLICATION

May 28, 1956

50 cents

**Bristol Britannia:  
Britain's Challenge  
To U. S. Jet Liners**



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**JP-4 Jet Fuel Performs  
As Favorably as Kerosene**

**'Cessnarama' Boosts Sales,  
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ONE

**KAYLOCK**  
TAKE IT MADE  
all-metal self-locking  
**HEX NUT**



**REPLACES ALL THREE**

NOT THESE



AN363



AN365



AN364



AN363  
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...but  
**THIS**

and gives you

**WEIGHT SAVINGS and SPACE SAVINGS**

Shear-nut height with tensile nut strength  
—and the lightest of all self-locking nuts.  
250"-550" F. requirements

Kaylock nuts are precision products produced in full conformance with Air Force-Navy specifications AN-N-5 and AN-N-10. For more information, write for our catalog.



THE KAYNAR COMPANY • KAYLOCK DIVISION • BOX 2003, TERMINAL ANNEX • LOS ANGELES 54, CALIFORNIA  
Circle 301, Aerospace News Oct., 1954

UNROLL IT—



and **FLY AWAY!**



Probably the closest mate has yet come to a Magic Carpet!

For here is an airplane built of inflatable reinforced fabric — a plane which can be stored like a carpet and flown away!

Developed, designed and built by Goodyear Aircraft is a type of airplane more than 12 weeks' time — it may be available day when airplanes may be equipped with their own lightweight, collapsible, portable plane.

The wings, tail assembly and pilot's seat are made of Aircloth, a new structural fabric developed by Goodyear, which "makes like a beam" — a double-walled inflatable fabric converted by hydraulic pressure into hard bearing Nylon structure. As a result, the airplane remains rigid and maintains its

configuration when inflated by a compressed air cylinder to pressures far lower than required by the tires on a family car.

The fuselage employs the same collapse fabric utilized by Goodyear Aircraft in building the Navy's huge lighter than air ships.

So strong is this true-to-life Magic Carpet, the only tubular struts involved are those needed to form the landing gear and engine supports.

It is another interesting example of the kind of imaginative engineering and skillful use of new materials being constantly demonstrated by Goodyear Aircraft Corporation in keeping new frontiers for air progress and for industry.

They're doing big things at

**GOODYEAR AIRCRAFT**

Plants in Akron, Ohio, and Lockheed Park, Arizona









Setting new standards  
for transparent enclosures—

## Plexiglas 55

Windows, canopies and other transparent enclosures have significantly longer service life when they are made of Plexiglas 55 acrylic plastic. That is why this improved grade of acrylic's standard transparent material is used on the Sikorski HO4S helicopter and on a growing line of other military and commercial aircraft.

Plexiglas 55 combines the traditional clarity, formability and resistance to scratching of Plexiglas with notably improved stress-resistance and a higher maximum useful service temperature. For the pilots of the future, we are working to raise the quality of transparent plastic to an even higher level.

Detailed information on Plexiglas 55 is available on request.

Aircraft on which PLEXIGLAS 55 is now being used for transparent enclosures include:

Boeing B-47	Douglas DC-7 series, DC-48
Boeing T-34	Lockheed T-33B, T2V1
Cessna T-37	North B-57B
Cessna F-105, XF-97	North American F2-4, F-100
Douglas A4D, F4D-3	Shenley H-19, HO4S, HC3



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## WHITTAKER GYROS

100% INSPECTION TESTS MEAN ACCURACY AND DEPENDABILITY!

Designed by engineers and built by technicians who have worked together for more than a decade, Whittaker Gyros offer unsurpassed performance.

Stainless steel construction (including gimbals), meticulous care, continuous testing of components and assemblies, plus 100% inspection tests of components, have resulted in an overall customer rejection of less than 2% — month after month.

**TYPE G100  
SLAVED VERTICAL  
GYRO UNIT**  
Scale: 100:1



The G100 slave vertical gyro is basically a two degree of freedom gimbal system incorporating an alternating or direct (ac or dc) power rate rate and an internal gyro spring and no pendulum. The gyro unit is contained in a housing of - 18 degrees in size and color gimbals.

The gyro may be furnished with either a mechanically sealed or a hermetically sealed unit.

The gyro is divided into several glass sealed hermetic units and can be furnished with any available sealed connection.

The G100 slave gyro is available with the following methods of indication:

<b>OUTER GIMBAL:</b>	<b>INNER GIMBAL:</b>
1. Potentiometer	1. Potentiometer
2. Commutator	2. Commutator
3. Synchro	3. Synchro
4. Resistor	4. Resistor

**TYPE G100  
SLAVED  
TELEMETRIC  
GYRO**  
Scale: 100:1



The G100 slave gyro consists basically of two two degree of freedom gimbal systems, one providing attitude and a direct or indirect power rate. A direct or indirect power rate spring and no pendulum is provided.

The two gyros are mounted in a single frame in such a manner that output indication is obtained about their mutually perpendicular axes.

**TYPE G100  
RATE GYRO  
UNIT**  
Scale: 100:1



The G100 type gyro is basically a single degree of freedom gyro incorporating an alternating or direct (ac or dc) power rate rate and an internal gyro spring and no pendulum. The gyro may be furnished with either a mechanically sealed or a hermetically sealed unit.

The G100 slave gyro is available with the following methods of indication:

1. Potentiometer	2. Commutator
3. Synchro	4. Switching Contacts

**TYPE G100  
FREE GYRO UNIT**  
Scale: 100:1



The G100 type free gyro is basically a two degree of freedom gimbal system incorporating an alternating or direct (ac or dc) power rate rate and a pendulum in size and color gimbals.

The gyro may be furnished with either a mechanically sealed or a hermetically sealed unit.

The G100 free gyro is available with the following methods of indication:

<b>OUTER GIMBAL:</b>	<b>INNER GIMBAL:</b>
1. Potentiometer	1. Potentiometer
2. Commutator	2. Commutator
3. Switching Contacts	3. Switching Contacts
4. Resistor	4. Resistor

**TYPE G100  
ELECTRIC DRIVE  
GYRO**  
Scale: 100:1



The G100 type gyro is basically a two degree of freedom gimbal system incorporating an alternating or direct (ac or dc) power rate rate and a pendulum in size and color gimbals.

The gyro may be furnished with either a mechanically sealed or a hermetically sealed unit.

The G100 electric drive gyro is available with the following methods of indication:

1. Potentiometer	2. Commutator
3. Synchro	4. Switching Contacts

**Whittaker Gyro**

DIVISION OF TELECOMPUTING CORPORATION

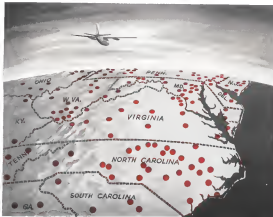
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Gyro is a registered trademark of Whittaker Gyros Corporation.









## SOUTH OF THE MASON-DIXON LINE... It's always a short hop to



Flying from Durham to D. C. for a government agency conference... from Baltimore to Birmingham for a sales meeting... wherever your trip, from Maine to Texas, you can find at one of the more than 600 convenient Esso Dealer Airports.

You'll be landing where fast, efficient service makes flying a pleasure. Experienced operators are ready to serve you with Esso Aviation Products—the same high quality fuels and lubricants used by

the world's major airlines and backed by over 44 years of testing and research. You'll appreciate the convenience of changing, to yourself or your company, the cost of gasoline and oil, lubrication, tire and battery service, loading fees, overnight storage in transit and minor emergency repairs. All you need is an Esso Credit Card.

So, whenever and wherever you fly—for business or pleasure—enjoy the service and convenience of an Esso Dealer Airport.

**FREE TO PILOTS!** For your free copy of "You and Instruments" by Col. Dwight Smith, packed with helpful information, be sure to see your nearest Esso Aviation Dealer.



Hoover Electric Actuators are available for Pushing, Retracting, Pump, and Control for Operating.

for hydraulic actuators	Model 1-100	low pressure hydraulic
Model 2-100	low pressure hydraulic	
Model 3-100	low pressure hydraulic	
Model 4-100	low pressure hydraulic	
Model 5-100	low pressure hydraulic	
Model 6-100	low pressure hydraulic	



# 9 HOOVER ACTUATORS

flex the muscles of the  
Navy's New Fury Jet



North American F-4 Phantom II in production at North American Columbia. This drawing for the Navy shows a Phantom II jet with a high rate of climb and speed in excess of 1,000 mph.

Hidden under the skin of North America's new F-4 Phantom II are nine custom-built Hoover Electric actuators that provide precise, dependable power and control—for flying the Navy's latest Super Jet.

Exactly designed—and precisely built—for maximum performance under all conditions—these Hoover-built actuators power control units have been an integral contribution to American aircraft development for more than a decade. Aircraft designers, engineers and pilots alike—only on Hoover dependability—and Hoover has always repaid that confidence with Performance PLUS!

Hoover Electric will design and manufacture special actuators and motion, special gearing and complete power packages for any application—in experimental or production quantities. Write today!

## HOOVER

2000 South Ocean Avenue  
Los Angeles 24, California  
Western Representative—Columbia, Ohio

ELECTRIC COMPANY



Peak performance at supersonic speed...

# LOCKHEED'S new F-104A, Starfighter...

fastest, most advanced fighter...built with

BRIDGEPORT Aluminum Die Forgings



Straight up or straight out...Lockheed's F-104A Starfighter is the fastest, most advanced fighter ever built.

Bridgeport Aluminums made the die forgings used in the construction of the mass-winged Starfighter. Advanced production methods and rigid quality control enabled Bridgeport to deliver high-strength forgings that more than met the Starfighter's specifications.

To learn more about Bridgeport Aluminum forgings and extrusions, let Bridgeport hear more about you - your new project, your material and alloy questions. Whatever they are, Bridgeport's experience and integrated production facilities will find a way to solve them. Today, get in touch with your nearest Bridgeport Sales Office!

For the very newest in  
**BRIDGEPORT ALUMINUM**

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the stamp of success in aircraft heating



Chances are each of the stamps on this page traveled in a plane heated by Janitrol, because all over the world Janitrol® aircraft heaters are considered standard equipment. Commercial airlines with world-wide clientele, business aircraft with world-minded executives...both have proven Janitrol a dependable source for cabin comfort, heating, windshield defrosting, and thermal anti-icing. Success is measured in billions of passenger miles, in low operating and maintenance costs, and acceptance the world over. If you operate, buy, build, or convert aircraft, flexible Janitrol heating equipment belongs in your planes.

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## WIRING ASSEMBLIES SEALED FOR ENVIRONMENTAL PROTECTION

Wire is the ideal protection for wiring assemblies requiring a high degree of environmental resistance without the use of metal enclosures.

Bendix, engineered and developed by the Scintilla Division of Bendix, uses multi-purpose thermoplastic material designed to protect and seal vital wiring assemblies from rain, age, chemical hazard.

By the combination of aluminum, steel, stainless steel, and Fiberglass, Scintilla has been formulated to meet the requirements of most adverse conditions.

For example, one may wish to require low-temperature flexibility, while another is concerned primarily with a high-temperature resistance, and still others apply criteria may prevent fuel and seal penetration, or perhaps a combination of all of these characteristics is the desired result.

That is why Scintilla is virtually a miracle material, for it can be "tailored" to meet a wide range of requirements, and at the same time, maintain the integrity of the finished product.

Scintilla can be provided in a variety of seal colors, and can be hot stamped to provide positive identification. Many electrical connector configurations available, as well as the T, Y, and variable multi-connection to provide reliable assemblies of any configuration.

Detailed information and data on Scintilla is available on request.

SCINSEAL

Can be tailored to meet  
individual needs and purposes



Scintilla is used in such specialized fields as automotive devices, ground radio equipment, missile control wiring.

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION  
ELIZABETH, NEW YORK



## At your service with the widest range of aircraft actuators

The actuator you need—he it for solenoids, rod ends, a foot system, or any of a hundred other applications—may be a stock item at Airborne. No other manufacturer makes as wide a line of actuators for the aircraft industry.

Our linear and rotary models range from over 20 lbs. to less than 1-lb. sizes, with load ratings to 15,000 lb. max. rpm capacity (linear)—or 1200 in.

lb. (rotary). Both linear Airborne components, then, are designed to be as universal in application as possible, consistent with aircraft standards of reliability and performance.

Beyond the broad limits of this line, our engineering group can, and does, design special aircraft components or complete systems, including actuators and controls.

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line of electro-mechanical actuators and control  
systems. Write for your copy today.





NAVY AVIATION ELECTRICIAN and GE "Tech rep" check out flight stabilization system on Chance Vought F7U-3 Corsair

## How on-the-spot service engineers back up General Electric flight control systems



GE SERVICE ENGINEER, Willie Jaynes, demonstrates the autopilot line maintenance tester to Navy aviation specialists

GE field service engineers provide valuable technical assistance to the Armed Forces whenever service is required on General Electric flight control systems. These "Tech reps" also conduct classes for pilots and aviation specialists on the operation and maintenance of GE flight control systems.

In addition, General Electric service engineers make detailed field operation reports on flight control system performance. These reports provide design engineers with information on system performance on operational aircraft for improving future GE flight control systems—systems that are now being designed and built for the latest supersonic aircraft.

FOR DETAILED INFORMATION on the flight control systems that General Electric is designing and manufacturing for our Armed Forces, contact your GE Aviation and Defense Industries Sales Office Section 221 S. Schenectady S, New York.

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

## Whittaker has valves in production for your missile system



In addition to our valves for aircraft, Whittaker is now producing a wide variety of valves for missile systems.

The following list shows some of the units now in production. The wide diversification of this line—plus Whittaker's extensive experience in the closed open-loop interconnections which characterize missile equipment—its suits in exceptional reliability and performance. Although the units listed below are for specific installations, they can be easily adapted for use with different pressures and line sizes.

We invite you to review this list. To obtain detailed information regarding any of these units simply fill out and return this coupon at the bottom of the page.

Whittaker's experience can be of utmost assistance in the solution of your missile design problems.

UNIT	PRESSURE (PSI)	LINE SIZE (IN)	DESCRIPTION
1	Aircraft Fuel	1/2"	Pressure Regulator
2	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
3	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
4	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
5	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
6	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
7	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
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95	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
96	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
97	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
98	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
99	Aircraft Fuel	1/2"	Rel. Val. with Shut-off
100	Aircraft Fuel	1/2"	Rel. Val. with Shut-off

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## The Snark Blasts Into Space with Zenith Plastic Parts

An event of monumental importance to our country's defense occurred when the Northrop Snark, the first of our intercontinental guided missiles to be unveiled by the Air Force, first soared into action from its launching base.

Zenith Plastic's Aircraft Division cooperated with Northrop in the development of the Snark, by

producing reinforced plastic parts, including the radome, essential for its accurate operation.

For the critical requirements of the latest addition to our nation's armaments in the air, Zenith offers complete engineering, laboratory and production facilities in reinforced plastics for aircraft and guided missiles.

**ZENITH PLASTICS CO.** **Z** gardena, calif.  
Aircraft Division

WORLD'S LARGEST PLANT PRODUCING REINFORCED PLASTICS FOR AIRCRAFT

JULY 26, 1964

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## AVIATION WEEK

VOL. 41, NO. 30

New York 36-130 W. 42nd St., Floor 1, Dayside 4-3080 (Night LD 4-3000)  
Washington 4, D. C.—National Press Bldg., Phone National 8-1404, Mables 7-9400  
Los Angeles 17-1115 West 54th St., Floor 1, Mables 4-5555

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### COVER: Bristol Britannia 300 will go into service on British Overseas Airways Corp. routes to South Africa this summer. Meanwhile, Bristol is attempting to convince the U.S. market with a sale to Capital Airlines. Bristol's cooperation in accepting a delivery delay, could enable Bristol to deliver Britannia to Capital next April. Bristol's expansion plan is described beginning on p. 94

### AVIATION WEEK • MAY 28, 1964 • Vol. 41, No. 22

### Monday AM and ABC



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SAN GABRIEL, CALIFORNIA****EDITORIAL****Technology Forces New Military Roles**

The current rash of interservice warring emanating from the Pentagon, like the result of the Navy demands in 1946, stems from the inexorable impact of new technology on the military problem. President Eisenhower has wisely pointed out that these differences between the services are not bad; and that they are a necessary process in the constant evolution of military policy to fit the new requirements of defense effort.

From the time that gunpowder displaced the armorial knight and the longbowman, professional military men have been slow to understand and accept the new technological advances that have inevitably changed the methods and concepts of waging war.

In 1949, a large portion of the Navy high command honestly believed that no aircraft could fly 10,000 miles without refueling, drop a full atomic bomb load at the halfway point and generate sufficient speed and altitude performance in the target area to fail defensive efforts. The performance of the B-36 bomber, which has since proved all of these points to actual flight operators, was far beyond any previous technological experience and proved again how dangerous it can be to interpret the technical future in terms of the past.

Even Admiral Radford, who once trained the B-36 program as "bullet dollar billiards," might be willing to concede now that this adjustment was based on insufficient understanding of a fast developing technology. In fact, there is evidence to indicate Admiral Radford has come around of long range jet developments, since he has lent strong support to the expanded Air Force B-52 bomber program.

The Air Force was born in a tremendous technological stride and has long claimed to use the fastest existing technology the world has to offer. Consequently, it is more in tune with the revolutionary developments of the last two decades than its sister services. The Navy has had long experience with a slower moving industrial development but a now fully recognized in the supersonic aircraft, nuclear propulsion and nuclear weapons complex that will certainly create among new weapons to match itself of the sea.

The Army with its tradition of "blood, leather and guts" has been the last of the three services to fully grasp the impact of the new technologies. As a result, it is in the tightest squeeze when roles and concepts are assigned on the basis of new weapons produced by technical development, such as guided missiles. The Army has made a tremendous effort to acquire itself with technology during the reign of Gen. Maxwell Taylor as Chief of Staff, but it is clear that it still has a long way to go before it can compete in technical development with the other services.

Among its severe handicaps are the lack of opportunity for advanced technical training of its officer personnel and its adherence to the outmoded mental type of operations for new weapons development. The Navy and Air Force, on the other hand, have long since established a firm industry partnership in the basis for their technical progress.

The impact of technology on military organizations inevitably produces both intra- and inter-service battles

between the conservatives who blindly cling to tradition and the radicals who wish to plunge boldly ahead.

Even in the Air Force, the new and most technically sophisticated of the services, this conflict between the "brown shoes" and the "black shoes" is seething and will produce its share of public enigma before it is finally resolved. Similarly, the Navy, although of the "tan shoe" Navy who bought their more conservative leaders of the "black shoe" battling counterpart two decades ago are now in the conservative wing battling the assaults of the nuclear submarines and guided missile men.

It is evident that the extremely rapid pace of technical development in the postwar era that already has pushed weapons into the fringe of outer space, given them astronomical ranges and area obliterating capabilities, must produce profound changes in military organizational, strategic and operational concepts if they are to be effectively utilized. The Defense Department is just beginning to feel the first slight tremors of this technological earthquake as the boundaries of its traditional horizon.

The old concept of dividing military forces by the elements of land, sea and air has been rendered meaningless by the tremendous forces unleashed by the atom, jet and rocket. It is obvious that military operations should be moving in the direction of a more functional service organization tailored to meet a broad military position rather than control a specific element. The prototype of such a functional organization now exists in the Continental Air Defense Command in which Air Force, Navy, Army and Marine units are operating under a single command organized to provide air defense of the North American continent. Perhaps what eventually will supersede the Army, Navy, Air Force and Marine Corps will be four functional types of military commands in which elements of land, sea and air will be combined to do the required job. These might be:

- **Striking force** containing all the now classified elements of our atomic-weapon striking force such as the long range supersonic bomber, ballistic missile, aircraft carriers, long range bombers, missile-launching submarines and intercontinental missiles.
- **Defense force** utilizing all the defense elements such as the submarine, surface and aerial missile projects, land-based radar chains, guided missiles, fighter aircraft, ground-based interceptors and guided missiles.
- **Police force** embodying the basic principle of the Marine Corps but equipped to fight anywhere in fringe wars or occupy troublesome areas using the most modern weapons and aerial mobility.
- **Logistics force** discharging the supply function for all services by the most modern air, sea and land methods.

It is an extremely healthy sign that our military leaders are pondering and questioning and occasionally arguing with the vigor that comes only from free conviction on the issues confronting them as a result of technical development. If they were completely unaware of these trends, satisfied with tradition and uninterested in progress there would be real cause for alarm.

—Robert Hots





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The AF-44C Series Ball Bearing is made of stainless steel and is equipped with a special type of ceramic balls. It is part of the Fafnir series.

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## WHO'S WHERE

### In the Front Office

Robert B. Miller, vice president/general manager, Northrop Aircraft Inc., Hawthorne, Calif.; Vice C. Earl Miller, vice president/manufacturing; Richard B. Nelson, vice president/manufacturing; George Douglass, vice president/general manager; and Thomas H. Quinn, manager (Aircraft Division).  
 Jerry B. Rasmussen, president, Northrop Aircraft Corp., New York, N.Y.; Vice president/Marketing & Sales; and Vice President/Finance & Administration.  
 F. W. Rasmussen, president, General Electric, North York, N.Y.

Dr. Charles E. Hansen, vice president/manufacturing and of Job 1, Ford Instrument Co., Division of General Motors Corp., Long Island City, N.Y.  
 Richard E. Hines, regional vice president/sales (Middle), American Airlines, New York, N.Y.; and a senior vice president/sales manager (New York).

Charles L. Hubert, executive vice president, H. K. Porter Company Inc., Pittsburgh, Pa.; Vice president C. K. Debus, who has retired but will serve as consultant to the company.

### Honors and Elections

Dr. Roy H. Debus, managing director of A. V. Roe & Co. Ltd. and Dr. Hugh C. Debus, director of the National Advisory Committee for Aeronautics, have been elected the honor of lifetime membership of the Royal Aeronautical Society. The society also awarded the following awards: Royal Society (posthumously) for the chief designer of the Vickers-Armstrong Ltd. British Gold Medal for Aeronautics; J. Royce, Royal Society Medal for Aeronautics; Sir William Farnley, member of the society; Sir A. V. Roe, the society's gold medal; Dr. E. S. Smith, chief engineer of the de Havilland Empire Co. Ltd.; the society's silver medal; J. W. Brown, the society's bronze medal; and Capt. M. K. Stewart, Warfield Gold Medal.

Stewart M. Brown, president, M. Brown, Aviation Services, Inc., was awarded the Certificate of Appreciation of the Junior Chamber of Commerce of Philadelphia for his contribution to the development of the private air plane.

### Changes

Dennis M. Lanning, West Coast vice president/sales division, Martin Co., Baltimore, Md.

Frank J. Rasmussen, general manager, local product, Military Air Transport Co., Washington, D.C.

E. R. K. (Jack) Field, manager flight operations and Capt. B. A. Rasmussen, flight development, Canadian Pacific Air Lines, Vancouver, B.C.

George W. Leber, vice manager, north regional, Microwave Electronics, Electronic Systems, General Corp., Great Neck, N.Y.

H. S. Peterson, chief engineer, East Coast Aircraft, Inc., Fairfax, Va.; and N. S. William M. Robertson, property manager, west assistant, Radio Shack.

## INDUSTRY OBSERVER

McDonnell Aircraft Corp. plans a variety of modifications to production versions of its F-104 Phantom long-range interceptor. Modifications for several nonstructural items which operated at high speed flight will be incorporated early. Landing gear wing extension will be added to convert severe pitch up at high speeds. Landing gear also will be modified to prevent tire failures from cutting hydraulic brake lines.

USAF is developing horizontal maintenance hook for use with the Pratt & Whitney JT7 turbojet. Horizontal refueling line stands used for factory assembly and permanent base overhaul can be provided for field use necessitating the use of horizontal equipment.

Comman's F-101-102 is now being flight tested with a General Electric JT7 turbojet replacing the Wright J65. The JT7 modification features an air intake to control exit flow down the exhaust duct of a mechanical variable position nozzle.

Douglas MD Skyhawk has been flight tested with both vortex generators and a set of wing fences to improve aerodynamic characteristics. Production versions of the lightweight stowage benches are taking an additional gross weight due to new equipment added by Navy requirements.

General will use the General Electric JT7 turbojet on all versions of its B-58 Thunder supersonic bomber because of engine engine availability, thus first anticipated. Original plans called for B-58 JT7s to power the first B-58.

General has sold a Model 440 Metropolitan to the Green L. Martin Co. in an executive transport sold in negotiating for another 440 sold to the Bessieja Douglas baseball club. General also plans to extend the basic 440 production line into the first quarter of 1958.

Armstrong is evaluating the General T-37 to determine its suitability as a modern observation plane. Arm's wants speed for quick penetration of enemy-controlled territory, endurance for longest observation and simplicity of maintenance for front line field operations.

Pratt & Whitney Aircraft has delivered its first two JT5 15,000-lb-thrust turbojets to Republic Aviation Corp. for its F-105 and to North American Aviation, Inc. for its F-107 fighter-bomber version of the basic F-100 design. Canada also is scheduled to get the JT5 soon for its F-101B all-weather interceptor.

East Japanese-licensed F-100 will fly this fall. The Sabon are being assembled by Mitsubishi Heavy Industries, Nagano, and under license from North American Aviation. Each that was a Lockheed F-105 was used by Kawasaki Aircraft was built in Japan. Each aircraft is being supplied to the Japan Air Self Defense Force.

Australia wants to manufacture the Lockheed F-104 for its own and the Royal New Zealand Air Forces. The manufacturer probably would be the Commonwealth Aircraft Corp., which has been building Rolls-Royce Avon-powered F-86 Sabons for the Royal Australian Air Force. An Australian version of the Starfighter might be built around a British engine.

Boeing is testing a new type of extra-wide landing gear in which only one wheel carries... The aircraft is certified on a Super 16.

Boeing's 707 jet transport will be capable of descending at 15,000 fpm, with landing gear and spoilers extended. As a consequence at other emergency, descent from a maximum cruising altitude of 45,000 ft. to 10,000 ft. would require only two minutes.



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### New Navy Secretary for Air

Gerrard Norton, World War II Navy aviator and a former Assistant Secretary of State, will soon step in as Assistant Secretary of the Navy for Air, succeeding the incumbent James H. Smith. Although Smith has not yet officially announced his resignation as the aviator behind it, Norton already is in the Pentagon underwriting the post. His present job is with the Office of the Assistant Air Force Secretary for Research and Development.

### Red Light for Lowen, Minetti

Early Senate confirmation was expected last week of Charles F. Lavers as administrator of the Civil Aeronautics Administration and G. Joseph Moench as a Civil Aeronautics Board member. The nominations of both Moench and Lavers were favorably reported out of the Senate Commerce Committee at mid-week. Moench's nomination was unanimous, but a minority report on Lavers was filed by South Carolina Sen. Thomas A. Wofford, who presumably was angered over the CAA's policy of denying federal aid to airlines of support terminal facilities with restricted facilities.

## More Trouble for OSI

The House Information Subcommittee, headed by Rep. John E. Mica (D-Fla.), will challenge the Office of Strategic Information's assertion that it has authority to establish policy for other executive agencies on the release of non-excluded, but "strategic," information (AWJ Apr. 10, p. 29). Committee Democrats, at which OSI is a part-timed orders setting up OSI "pursuant to a directive of the National Security Council," Mica committee has now managed to get NBC to document specific language of the part of its directive dealing with OSI. This language asserts it cites that OSI is supposed to give guidance to other agencies, but does not have authority to make policy. OSI Director John Sings and other senior OSI officials will be called to testify again on April 18.

### U. S.-France Bilateral

The United States and France proposed discussing hot work in Pass in capacity personnel in the bilateral agreement between the two powers. Many hours of consultation in the interpretation of the agreement on fifth freedom rights for Pan American between Paris and Istanbul. The French are reluctant to let Pan American carry passengers from Paris to Turkey. The American view is that the airline should be able to pick up through passengers stopping in Paris, as well as local traffic bound for Istanbul.

### Symington Log

Public release of testimony given by military witnesses before the Senate Intelligence Committee on the CIA's role in the Vietnam War is being delayed for 30 days due to the problems of getting written accounts of events from the Portuguese. Two military accounts involving Macao have been encountered in clearing testimony, but the staff still available to Admiral Arthur Dain, usually

appointed Portugal consul is slowing the process. Committee members credit Admiral Datta with doing an able job on the issue of test ban. The committee probably will continue hearings through next of June with Defense Secretary Charles E. Wilson as the final witness.

### Pan American Cracks Iron Curtain

Pan American World Airways is getting ready to crack the long-Corbin. The airline has been invited by the Soviet Embassy to come to Russia and discover leading sights at Moscow and Leningrad. On the other hand, the State Department apparently has closed the case, stating that it has no objection to the discussions. A passport granted to Pan American, however, is subject to review by the U.S. government. No reciprocal rights for American, the Russian airline, will be involved in the discussion.

But America is likely to send a huge donation to Moscow, and the author repeatedly alludes but not in a request for cash. If this American makes a deal with the Russians it will be the first American author to fly across the Iron Curtain to Moscow. The author received U. S. rights to operate in Leningrad and Moscow where he brought American Overseas Airlines in 1950. Smolov can be started on the route with relative ease, since the author already possesses a far east in Helsinki.

### Army Aviation Interests

Aquatic Science Division is interested in research and development projects for a new small transport vessel that can operate in and out of small and unprotected fields a new-type observation platform small hydrology rigging a variety of approaches to the countermeasures including chemical propellers and deflected jet system lightweight aircraft instruments submersible television cameras radars and related detection equipment and new types of landing gear.

### Airmail Postage Outlook

Postmaster General Arthur S. Hays Sulzberger plans to boost domestic annual postage from three to four cents as a source—and add \$15 million in additional revenue—passed the first hurdle, when it was approved by the House Post Office Committee. The legislation, by a major block in the Senate, Sen. Otis D. Johnson (D-S.C.) has fresh resisted the increases and, instead, has called for economies to reduce the department's deficit.

### Profits' Report Due

The House Armed Services Investigative Committee, which completed lengthy hearings on the profits of 14 weapons manufacturers earlier this spring, plans to issue its final report and recommendations in about three weeks. Hearings of the committee continuing data developed during the public hearings and reports filed by the defense companies should be available in approximately six weeks.

-It's dangerous, still







present bombing strategy.

• In World War II, bombing was done through air defenses, death to targets. But because of the development of defense techniques in the future part of the future world war, it is desired to drop bombs on defense, infrastructure, communication systems, fighter fields, radar sites, etc.

• The capability of strategic forces to meet defense challenges have kept pace with development of defense forces.

"The facts are that defense systems are becoming more and more sophisticated," Gen. LeMay reported, "but the same principles of physics that are applied to the defense system can be applied to offense systems."

Because of high-velocity weapons, he pointed out, "bombs are on their way to do a job that we used to send a bomber to do. . . and the smaller the force, the harder it is for the defense system to detect it." SAC's defense system, he told the subcommittee, "is not a defense system, it is a defense system."

The best thing Air Defense Command can do for SAC is to provide warning time," Gen. LeMay stressed. "It does not make any difference whether you shoot down one or 100 of the bombers coming in. That is not so important. But what time is that is the factor that will give us a chance to see more of our bombing force."

Gen. LeMay pointed out that it is

possible for Russian submarines to come into the Gulf of Mexico and launch missiles from there. By 1960, he said, Russian submarines "will be able to sit off from Russian territory, go out around the Atlantic Ocean, come in from the northwest and hit the east with very little warning."

"It is one of the principles of war," Gen. LeMay declared, "that the advantage lies with the offense, and it is even more true, I think, in an nuclear than it ever was in the past."

Other testimony highlights include:

• Gen. LeMay told the subcommittee that there are fewer targets in the U.S. than in Russia because we are based on a smaller number of air bases.

• He concurred with Sen. James Duff (R-Pa.) that the accuracy of the intercontinental ballistic missile will be in very great doubt for a very long time and while they could drop them, they would not know where they are going to land.

• Gen. LeMay agreed that the ICBM should have top priority in development.

• Maj. Gen. John McCosack, SAC, Omaha, of plans reported. At present the U.S. is "way ahead" of Russia in strategic air strength. In 1955, the total bomber capability of the two forces will be approximately the same in long- and medium-range bombers. In 1955, Russia will have more than the number of intercontinental Boms and Boms is the number of B-52s in the USAF.

## Nike Missile Hits Ryan Firebee, But Controversy Is Not Resolved

By David Anderson

White Sands, N. M.—The Army's controversial Nike antemissile missile demonstrated its capability against air targets by a successful strike last week against a Ryan Q-2 Firebee. The target drone was heading toward the launching site at more than 500 mph and at an altitude of about four miles. At impact the estimated eight-mile run moved three 20 inches from launching site.

Army officers emphasized that the test was a tough problem because of the small size of the drone and the relatively low altitude of the intercept. No critical hits were used to improve target acquisition or tracking by the Nike batteries. The entire operation was a counter firing as part of the counter-missile test program which the White Sands Proving Ground conducts as a mobile system for the Army Field Forces. The Army, in addition to the

Nike, employs launched the Corporal antiaircraft guided missile, and the Honest John, a short-range on ground artillery rocket. Both these weapons and the Nike are operational with the Army.

### Army Claims

Success of the Nike strike against the Q-2 still leaves unanswered the controversial question of whether or not the Nike is effective against the Russian operational Bear, Badger and Bison bombers all with bomb run speeds in the 700 mph class at altitudes above 50,000 ft. But Army spokesmen said that the Nike is a current firm would take on any known target, and launch to 10,000 ft with no limit.

Nike has been fired at 600-mph targets. Presently the USAF's Mustang and Apache interceptors have been programmed to take over action during the run, the Army added. Operational



COMPLETED REDSTONE MISSILE rolls off Chrysler production line. After successful flight test, model is dismantled for shipment.

## Chrysler Produces Redstone Missile For U. S. Army

TECHNICIAN enters tail cone to complete electrical wiring.



REDSTONE MISSILE is ready for transfer to field assembly line.



TAIL SECTION views and openings are covered for shipment.

DUST rolls on ground as Nike winds down off the strike against Firebee target drone.



reliability of the rounds at about a spacing of 95 ft, an 8-ft probability factor that one hit, which means that two rounds are needed in precise to guarantee a kill of the target.

During the Nike test, two rounds were fired against the drone. Three hit-and-run from the field forces and

two from the Proving Ground's Goddard Nike were assigned the job of destroying the target in the destruction of: First failure to acquire the target was to fire first.

The drone ran into more damage on a fourth round. About 4,000 ft from the launching site, the system began and a few seconds later a five-second round-down boom from the speller system.

The first Nike round up off the stand vertically, dropped its booster and began an abrupt turn up-angle to strike the drone. A few seconds after the first firing, a second Nike round took off as a smaller light path.

#### Undersea Hits

Within a few more seconds the first round burst striking into the belly and underwing of the drone. Right after the second Nike burst on the predicted flight path of the Q2 which already was coming under its recovery chute.

Recovery and analysis of the drone took several hours. The hit indicated the strike would have been decisive against a large aircraft, although the drone itself was not both damaged. The small size of the drone makes possible a more rugged structure than a full-scale airplane would have. Furthermore, the Nike warhead fragments into a type, and not a blast effect as Nike A shatters.

The two Nike rounds fired were Numbers 1830 and 1851 in the Proving Ground program with the subsonic missile.

Most spectacular firing was test launching of the Parachute-Craft. Great circles to include missile size of more than 100 that have been fired from the Army test Corporal in the world's first guided ballistic missile. Its flight path is compared with a standard, compared for a particular range and was corrected along the trajectory even after burnout of the fuel.

Ground-down and firing were exactly as scheduled. The missile blasted off its launching platform and accelerated upward for about one minute under the power of its sea-and-air fuel motor. To all flight time to impact of the target was 275 sec. First test series indicated that the Corporal had been right on target.

Two production proof tests were fired on the Honest John antitank rocket in production at Douglas and Hercules Electric Division is a new success series.

Both rounds had been assembled from a random selection of the components that make up the rocket on an M16 bottle control line to maintain a sleep size in flight. M16 tests in impact on target, immediately after launch, and a 1,500 ft warhead.

#### ARDC to Andrews

Washington—Headquarters for the Air Research and Development Command will be shifted to Andrews AFB Md. from the present cramped and inadequately equipped quarters in downtown Bethesda.

In last week's announcement of the planned shift, no specific date was set for the long-delayed move to the suburban Washington site, one first predicted by Aviation Week some two years ago (AW Feb 22 1956 p 12).

Secretary of the Air Force Donald A. Quarles cited as reasons behind the move the requirements for their location by the ARDC and the Air Force Foreign Commerce, the National Defense Committee on Aeronautics and other federal government agencies.

Homeport John says is 70,000 sq ft with the 1,500 ft warhead. The rocket is 27 ft, 1 in long, 10 in in diameter at the widest part of the head and 23 in along the body. Its gross weight is 6,000 lb.

#### Peak at 30,000 Ft.

Propelled at a single point of charge weighing 2,000 lb. After being launched with the booster at 70 mph of air velocity, Honest John reaches the peak altitude of 30,000 ft in 41 sec and the maximum 50,000 sq ft area in 80 sec.

On a low angle trajectory with launcher elevated 11 deg, just after take off 900 ft is reached in warhead and impact at 10,000 ft in nearly 17 sec.

Records kept in last week's demonstration were Numbers 527 and 528 at the Proving Ground.

Current work laid on the integrated range at White Sands is aimed over 112 different projects, including such Army missiles as Dart, Hawk and Lance in addition to Nike Corporal and Honest John.

#### KEM Buys Hollow Hamilton Propellers

Hollow, aluminum alloy, Hamilton Standard propellers will be used on the 12 Lockheed Electra ordered by KLM Royal Dutch Airlines. Order for the six "Industrie Model V4000" propellers was announced last week.

The 114-in. propellers are equipped with a control system which can be removed independently of the propeller. Hydraulic fluid supply is separate from other aircraft systems.

The hollow propellers will be useful control. The same propeller models for tailgating aircraft are available with solid aluminum blades.

#### Subcommittee Hears Small Business Plea

Los Angeles—A plea for an end to competition, a perfect against small businesses having to compete with large firms operating government-financed facilities and transportation for program payments to small businesses in the same line as they are asked to large prime contractors highlighted testimony during a two-day hearing last week before a subcommittee of the House Small Business Committee.

Rep. James K. Eastman (D-Calif.) and Tom Studd (D-Calif.) sitting in the subcommittee heard John Marchall, Executive Director of the Small Business Administration, protest that the direct and indirect effects of competition on small business reduced incentives to reduce and improve production methods. He argued that other than the act by regulation is that small business before Congress be created.

Marchall noted the effect upon small concerns of a large company, operating government-financed plants and equipment competing for subcontract. Small business firms should not automatically lose but not in cases like this he said.

Rep. Gene Hartley Jones, Deputy Director of Procurement and Production for Air Materiel Command, Wright AFB, Dayton, Ohio, and Rep. John J. Pickens, General Representative of the Navy Bureau of Aeronautics in the Western District both testified as to the policies of their respective agencies in acquiring subcontract clients in contracts with large prime contractors. Testimony from representatives of prime contractors was given in Dallas, Texas, North American Aviation Inc. large USAF search engine, and Douglas Aircraft Co. Inc., which does a large proportion of its business with the Navy. Both testified



Navy Getting Beech Missile Target

First deliveries will be made in June of Beech Aircraft Corp's XE200 target drone to Naval Air Station Test Center, Ft. Shreve, Calif. NAMEU in July will begin evaluating the vehicle's suitability for evaluation and to begin procurement program. Powered by a 120 hp supercharged McCulloch engine, the XE200 is 30 ft long, 60 ft in diameter, 120 ft in height, and can operate at over 10,000 ft. Wingspan is 12 ft. The Navy contract for a test quantity was awarded Beech after a design competition involving nine companies was conducted.

at a public hearing in Washington to small businesses on the basis of competitive bidding on past delivery dates and other pertinent matters.

The program against subcontracting was made by C. C. Holman, president of a small subcontracting company who testified that to his personal knowledge, no small concerns

had gone into bankruptcy during the past year because they could not bear the financial strain of no payments until contracts were completed. He asked testimony in Marchall that small businesses do not want subsidies or preferential treatment, but they do want consideration when contracts they could fill economically are being considered for letting.

#### Senate Group Restores \$4.5 Million to CAA, CAB

The Senate Appropriations Committee last week restored \$4.5 million for various administration in the House from the Civil Aeronautics Administration and Civil Aeronautics Board budgets. The Senate group gave the CAA the full \$40 million it requested to start its first year federal multi-annual plan and increased the \$196,115,000 total CAA budget given in the House to \$202,115,000.

The House gave the CAB \$15 million for its multi-annual plan and \$4,578,690 for administration. The Senate committee increased the CAB budget to \$17,4 million and added \$5,000,000 to the administrative budget.



CORPAC, under its wings, under its wings, is fired at White Sands.







## News Digest

U. S. Marine Corps will receive North American Navy F-4 Corsair aircraft based on the First Marine Air Wing in Japan will get aerial planes. Training of ground and aviation personnel for the F-4 is now in progress at Alameda Naval Air Station.

Rad Keger resigned last week. Chief of the Civil Aeronautics Board Congressional Liaison and Public Information Division. At the same time, Leonard B. Shaffer, Jr. was appointed as Chief of the Public Information Section by CAB Chairman James R. Doolittle, a job loss which he was relieved by. Alan Rabin, just before Keger, left the Board in April. Keger's resignation stems from a disagreement with Doolittle over Shaffer's nomination.

Office of Technical Services, U. S. Dept. of Commerce, has released fourth annual report of Air Force's experience in investigation of accidents for handling training, maintenance, and cockpit fuel. It can be ordered from OTC, U. S. Dept. of Commerce, Washington 25. Price \$3.50.

Major Roy L. Anderson delivered first Sikorski HO4S helicopter from Indian to Naval Air Test Center, Patuxent River, Md., for testing.

Classic hunter at Air Proving Ground Command, Eglin AFB, Fla., recently tested. Allison powered aircraft at 67 day. They were the McDonnell F-101N Demon powered by Allison J71A-1 turbojet, Lockheed C-130 Hercules equipped with two Allison T55 turboprop engines, and Northrop F-5D Scorpion using two Allison J33 A-155 turbojets.

Republic of Colombia has ordered six Sikorski YH-19s from Canadian Ltd. in Montreal for delivery June 1.

Planes and spare parts for planes now being imported into Argentina. It has market exchange rate (convertible) will mean to the dollar without sanctions. Exceptions are certain spare parts for Commercial A57 and C55 engines. Planes and parts formerly were imported under the official exchange market (with the dollar at 15 to 1).

Latin American Petroleum Council (LAPC) says it will install radar equipment on planes flying international routes to the U. S., Europe, Cuba and Peru. The airline and the equipment will be installed in three super Constellation. LAPC expects to extend European flights to Frankfurt in 1958 with a stop in Peru.



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John Phlipper Coates



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B-52D on Maiden Flight

First B-52D produced at the Machos, Kiss, Division of Boeing Airplane Co. made its maiden flight Nov. 14 with test pilot Rod Rasmussen at the controls. A five-man crew put the right jet aircraft through test procedures in a 3 hr., 32 min. flight.

## Lobby Charges Hit Non-Skeds

Washington—The alleged lobbyist activities of a supplemental airline caught the spotlight during House Airy. Last September hearings led with when Alexander G. Hardy, National Airlines' senior vice president, admitted a lot of what he termed "aggressive" and "lobbyist" for Trans American Airways (Trans American Airlines).

Those that were named by Hardy included lawyer Murray Chastner, retired U. S. Army Gen. Omar Bradley and Sen. Joseph C. McCarthy (D-Wis.).

Trans American promptly denounced the testimony and asked the subcommittee to provide hearing time for any and all of the individuals named by Hardy in what it called an "irresponsible and unethical article."

In last paragraph testimony, Hardy charged Trans American with a "deliberate campaign of wholesale violation of the law and defiance of the Civil Aeronautics Board." He asked for a thorough investigation. He said, "would make known the concrete facts" and be, the airline to attack its gains.

### Trans American View

Trans American retorted by asking for an exhaustive investigation of the whole story of (alleged) airline's person, on the CAB and other government agencies to let the entire story of new cases.

During the hearings, Hardy told the subcommittee by noted risk that its members look into the relationship between the person he named and Trans

American Airlines. He was contacted by subcommittee Rep. Emanuel Celler (D-N.Y.) at the conclusion of his charges.

Cells and, however, that the committee would contact the person named by Hardy.

### Hardy's Indictment

Others that were named by Hardy included:

Hardy, McClellan and William C. Hart, North American Airlines and some top-level lawyers at the CAB; Laurence H. Hoffman, former staff director of the United States Small Business Commission; Ed Stettin, an assistant to Hoffman with "excellent connections"; Vernon Rasmussen, a high-powered North American lobbyist who also a "company director of the National Commission for an Effective Congress."

Condon Jackson, an effective lobbyist and a top officer holder in the American for Democratic Action; Raymond Butler, an assistant to Stettin; Adams when Adams was New Hampshire governor.

Hardy termed Trans American's history a "national law tale" and a real lesson in "how to get rich by violating the law." He accused the carrier of operating, doing, scheming at first departure business, direct violation of the law.

The "booklet series" of the company's lobbyist, lawyer and public relations agents has enabled the company to take out several millions of dollars while posing in small business, Hardy charged.



# Announcing—the Fairchild F-27 *Friendship* Propjet power for business on the go



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Address inquiries to: E. James Pfeiffer, Executive Director of Customer Relations, Fairchild Aircraft and Equipment Corporation, Westchester, N.Y.

## AIR TRANSPORT

### Canada Installs New Traffic-Control Plan

**Beginning June 1, aircraft flying between 9,500 and 23,000 ft. must use IFR regardless of weather.**

By L. L. Day

**Washington**—Beginning June 1, all aircraft flying over designated Canadian airspace between the altitudes of 9,500 and 23,000 feet will be compelled to operate under Instrument Flight Rules (IFR) regardless of weather conditions (West of longitude 114, the minimum floor level will be 12,500 feet to account for the Rocky Mountain area).

The Canadian order detailing the IFR plan is a traffic-control measure designed generally to avoid response from affected U.S. agencies. The law, passed a year ago, was made by the Aircraft Owners and Pilots Association. Most of the spokesmen said, however, that the plan would be an application to U.S. airports as concerned.

#### CAA Plan

Canadian Administration officials, for example, generally felt that, while such a plan is an ultimate goal, toward which the U.S. can strive, additional personnel and facilities are essential before any such program can be undertaken.

In its five-year plan for federal aviation, the CAA has recommended a network of long-range radar facilities to police its route rights. The expense of equipping such a system is estimated at \$10,000,000, with open

times and maintenance costs amounting to \$10 million per year, the cost the program is scheduled to go into full swing.

The CAA report on its plan noted that the demand for air route control in traffic in good weather is becoming increasingly apparent. The plan is now being studied by the Air Traffic Control and Navigation Panel of the Air Coordinating Committee together with a report of Study Working Group 15 (the U.S. Navy for Instrument Air Operational Capabilities).

A spot check of the various indicated general approval of the plan, although several operations technicians stressed that the heavy volume of instrument traffic, and the complexities of the U.S. airspace, made any such arrangement for this country without lengthy planning and study. One airline official said, the Canadian order would not affect operations in Canada since company pilots already were under orders to operate under ATC procedures wherever in Canada.

#### ALPA Approval

The Air Line Pilots Association has been a consistent supporter of controlled airspace traffic under all conditions. But even at an international conference sponsored by the CAA and the International Flying Society, Capt. J. L. Smith, president of the

ALPA, said there is a growing movement within ALPA membership to operate all flights within the United States under IFR conditions at all times.

An ALPA representative told news items that the negotiations and as effect on the Canadian Aircraft Owners and Pilots Association "had provided somewhat" to the Canadian government. He added the order, however, and a form of business dealing. If the plan proves to be a headache, we will tell our people to stop out of Canada.

In announcing the order, George C. Martin, Canadian Minister of Transport, said in Ottawa that studies would be made of the private pilot search, do not do after the 9,500 ft. level and should coordinate with the IFR traffic, in combining with the order.

#### National Airport Trial

As an additional measure to provide from, pilots who do not have a full instrument rating may have their licenses endorsed to qualify them to fly on the various under VFR conditions subject to the production of an air traffic control. Enhancement is obtained after passing a modified instrument flying examination. It is noted in standards that the regular IFR test.

Somewhat added to the Canadian plan, although confined to area operations, is a test started August 1, 1955, by the CAA at the Washington National Airport in a "check down on traffic zone." The experiment requires



**Pakistan Viscount  
Takes Down**

Fairchild government Viscount, delivered to Pakistan in March, touches down at Lahore Airport in time. Slipped back on wing outside standard engine is one of two wing tanks carrying 124 gal each which increase Viscount range by about 200 mi. The tanks are removable.







# Airline Revenues and Expenses—1st Quarter

(Dollar Amount)

	Passenger Revenue	Mail Revenue	Express Revenue	Freight Revenue	Subsidy	Total Operating Income	Total Operating Expense	Net Operating Income (Before Tax)
<b>DOMESTIC TRUNK</b>								
American	\$55,733,543	\$3,005,484	\$1,094,179	\$3,287,271		\$63,120,485	\$52,133,660	\$10,986,825
Boeing	9,207,345	393,599	139,550	193,079		10,132,513	8,952,363	1,180,150
Continental	10,905,744	581,251	221,034	540,191		12,251,219	11,458,273	792,946
Eastern	1,491,615	14,000	9,473	49,216	308,791	1,862,105	1,811,559	50,546
Northwest	3,705,118	100,533	34,949	129,152	34,051	4,219,811	4,137,487	82,324
Delta	15,824,333	741,745	251,149	492,645		17,319,882	14,126,141	3,193,741
Eastern	12,823,895	533,811	240,031	621,874		14,229,611	12,699,955	1,529,656
Midwest	15,828,549	709,700	30,096	399,090		17,938,435	16,247,360	1,691,075
Northwest	1,504,352	88,113	30,952	119,875	109,608	1,843,900	1,735,438	108,462
Southwest	6,415,558	343,719	245,534	456,379		7,461,190	7,133,609	327,581
Trans World	10,971,817	1,029,025	329,150	1,792,348		13,122,340	12,471,239	651,101
United	42,514,494	1,735,148	1,128,176	1,928,337		46,387,157	37,418,689	8,968,468
Western	1,081,153	73,855	36,085	82,684		1,481,678	1,382,950	98,728
<b>INTERNATIONAL</b>								
American	1,188,799	42,438	430	152,944		1,342,481	1,219,233	123,248
Boeing	1,181,436	56,554		25,457	251,305	1,473,150	1,376,281	96,869
Continental	1,441,452			25,457		1,466,909	1,354,354	112,555
Delta	826,292	7,318		3,491	19,323	853,126	833,791	19,335
Eastern	144,315	17,111		55,316		214,742	204,441	10,301
Midwest	3,259,000	66,299		44,115		3,369,414	3,291,705	67,709
Northwest	1,583,323	9,914	6,922	76,320		1,676,480	1,603,504	72,976
Southwest	8,946,157	1,692,098	7,096	153,019		10,798,366	9,531,454	1,266,912
Trans World	873,108	43,090		156,594	351,009	1,483,801	1,388,419	95,382
United	15,846,875	2,389,473	8,223,135	2,721,628	371,628	27,991,341	23,805,546	4,185,795
Western	1,108,340	1,074,000		1,482,139	116,810	2,791,329	2,478,706	312,623
Pacific	15,846,875	2,389,473	8,223,135	2,721,628	371,628	27,991,341	23,805,546	4,185,795
Latin America	15,846,875	2,389,473	8,223,135	2,721,628	371,628	27,991,341	23,805,546	4,185,795
Europe	1,643,212	234,538		170,251	1,227	2,049,248	1,881,461	167,787
Trans World	7,961,576	1,735,738		849,079		11,546,393	11,473,460	72,933
United	2,475,454	102,166		36,093		2,613,707	2,435,314	178,393
<b>LOCAL SERVICE</b>								
Allegheny	748,804	53,537		3,148	7,988	813,537	748,895	64,642
Boeing	9,707	9,707		5,590		15,304	13,991	1,313
Continental	189,744	9,944		6,074	7,645	203,407	184,518	18,889
Delta	3,600	3,600		1,843		5,443	4,661	882
Eastern	205,559	2,000		10,012	47,381	265,052	248,524	16,528
Midwest	8,828,891	22,044	18,430	15,120	128,155	9,012,640	8,338,459	674,181
Northwest	11,433	11,433		41,438		54,304	51,115	3,189
Southwest	616,319	59,139	13,014	306,321	1,316,281	2,031,073	1,929,598	101,475
Trans World	9,062,171	25,129	12,184	47,087	1,716,491	11,863,062	11,516,495	346,567
United	428,878	13,751		411,438		844,067	818,738	25,329
Western	447,989	32,332	9,349	14,854	535,050	1,049,575	1,011,804	37,771
Trans World	487,893	49,079	17,705	89,047	505,830	1,249,554	1,238,236	11,318
United	456,311	13,666	5,047	7,130	347,978	830,132	798,233	31,899
<b>HAWAIIAN</b>								
Hawaiian	351,890	2,759		16,441	72,774	441,864	423,499	18,365
<b>CARGO LINES</b>								
American								
Boeing								
Continental								
Delta								
Eastern								
Midwest								
Northwest								
Southwest								
Trans World								
United								
Western								
<b>HELICOPTER</b>								
New York Airways	10,481	7,807	7,489	4,156	355,377	425,400	421,474	3,926
New York Airways	20,000	18,373	91,793	176,019	264,635	360,321	356,391	4,930
Helicopter Air Service		16,908		59,934	119,346	116,976	116,976	
<b>ALASKAN</b>								
Alaskan	85,167	26,266	5,273	58,445	919,377	1,049,468	1,002,883	46,585
Alaska Coast	94,386	97,308		19,214	76,141	276,049	184,686	91,363
Boeing	4,569	8,075		9,349	70,003	91,997	27,320	64,677
Continental								
Delta	49,187	13,013	9,515	34,560	159,449	166,677	166,677	
Eastern	90,031	71,620	530	49,778	129,369	241,743	241,743	
Midwest	86,974	60,282		31,137	36,705	154,844	154,844	
Northwest								
Southwest								
Trans World								
United	112,137	136,699	44,793	203,054	1,713,893	2,046,156	1,933,939	112,217

\*Not available.  
Compiled by AVIATION WEEK from data reports to the Civil Aeronautics Board

## Mid-Manhattan Helicopter Service By October Promised: Cummings

New York-Pennsylvania helicopter now carrying passengers from New York City to New York City, says Cummings, is not a new aircraft, but a new service.

Negotiations between the City of New York and the Port of New York Authority for use of the West 30th Street helicopter are progressing rapidly, Cummings said, and initial plans call for the new service to be operated by the city's Helicopter Service.

### Schedule Growth

Schedules will be stepped up to 30 to 35 daily flights around mid-October for the first operations. New York City's helicopter will be connected to the transit and express light rail by an automated north-south station. The S-55 will be equipped with specially designed seats, which will be available next month, the NTA official said.

At the press conference, Cummings said the city's helicopter will be used to transport the city's future plans. Cummings said that commercial helicopter transportation is on the verge of disappearing with the city's need to replace a lost airport. Cummings said that the city's helicopter will be used to transport the city's future plans. Cummings said that commercial helicopter transportation is on the verge of disappearing with the city's need to replace a lost airport.

### Must Show Proof

It is crucial for the operators to demonstrate this need, Cummings said, and to win the cooperation of all airlines, buses and subways. It also is necessary to be prepared to handle the possibility of a commercial helicopter would be available as soon as the first flight. Cummings said that the city's helicopter will be used to transport the city's future plans. Cummings said that commercial helicopter transportation is on the verge of disappearing with the city's need to replace a lost airport.

New York Airways is not expected to be the helicopter operator, Cummings said, but it is not out of the question. Cummings said that the city's helicopter will be used to transport the city's future plans. Cummings said that commercial helicopter transportation is on the verge of disappearing with the city's need to replace a lost airport.

The new problem may be solved or there will be no business. The S-55 is slightly faster than, much more comfortable, than the S-55. Helicopter service will be quicker than present service.

### Concessions don't behave

Vertical aircraft will replace the helicopter concept in the foreseeable future. Cummings said that the city's helicopter will be used to transport the city's future plans. Cummings said that commercial helicopter transportation is on the verge of disappearing with the city's need to replace a lost airport.

### Senate Group Assent To Re-Equipment Plan

Washington—The Senate Commerce Committee has approved legislation designed to aid in the development of a new aircraft, which will be available next month, the NTA official said.

The legislation would provide for the development of a new aircraft, which will be available next month, the NTA official said. Cummings said that the city's helicopter will be used to transport the city's future plans. Cummings said that commercial helicopter transportation is on the verge of disappearing with the city's need to replace a lost airport.

## Free Rides for Ministers?

Legislation permitting the airlines to offer free or reduced rate transportation to high-ranking government officials is now being considered by the Senate Commerce Committee.

The committee reported that the airlines would have to provide a special service for ministers without charging extra for the passengers. The airlines would also be required to provide a 51-hour flight to each city and to provide them to provide transportation for each flight.

Legislation is being considered to provide a special service for ministers without charging extra for the passengers. The airlines would also be required to provide a 51-hour flight to each city and to provide them to provide transportation for each flight.

Further to have modern equipment, the committee proposed, given a certain number of flights, with respect to passengers. This, in the end, would be a major step in the development of a new aircraft, which will be available next month, the NTA official said.

### Senate Group Assent To Re-Equipment Plan

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## CAB ORDERS

(See Page 14)

The American World Airways is attempting to enter New York City. The company is attempting to enter New York City. The company is attempting to enter New York City. The company is attempting to enter New York City. The company is attempting to enter New York City.







# Britannia Challenges U.S. Jet Airliners

By William Coughlin

Bristol, England—British Aerospace Co. is attempting to invade the U.S. domestic airline market with its 100-passenger turboprop Britannia.

Bristol and Capital Airlines are negotiating a contract which would put Britannia 360s into U.S. service next year, well ahead of the Lockheed Electra.

To enable the Britannia to go into early service on Capital routes, British Overseas Airways Corp. will accept later delivery of some of its Britannia 300s than would go to Capital next April under the arrangement.

Capital, whose Viking Viscount or does set the pace in the U.S. for turboprops, apparently is such to buy the 53.5 million Britannia in order to get a jump on competition who have ordered the Electra. Britain earlier than the Vanguard undoubtedly was a deciding factor in the shift from Viking.

To back its invasion of the U.S. market, Bristol is preparing to take these steps:

- Send a Britannia 300 on a worldwide demonstration tour of the U.S. similar to recent visits to European markets. This probably will be in mid-July.
- Offer a medium-range Britannia based on the Capital specifications.
- Start work on long-range Britannia 400 series. This aircraft with Bristol B.E. 25 engines will have longer fuel range and what will be in effect a thinner wing.

This area of making of a significant high-speed competitor to U.S. turboprops on the North Atlantic.

In addition to the five BOMC aircraft, Capital is expected to order ten of the former Britannia 310 series, which will be a medium-range model developed for the 115. There would be options for additional aircraft. The Capital order of well over \$50 million would establish the Bristol turboprop as the first among British competitors to U.S. manufacturers in the long-haul transport field.

Civil Aeronautics Administration certification already has been initiated with the cost of a CAA test to Bristol to study the Britannia. The company now is awaiting the CAA report on changes which may be necessary to achieve U.S. certification.

## Competitive, Complementary

Peter Macfield, managing director of Bristol Aircraft Ltd., the airplane subsidiary of Bristol Aerospace, sees the Britannia as competitive with the Douglas DC-8 and Boeing 707. But the big Bristol turboprop may be more than just competition. The decision by Canadian Pacific Airlines to order Britannia instead of jets for its transpolar and transpacific routes makes that apparent.

Macfield, formerly chief executive of British European Airways, is aware of two important areas where the British aircraft industry has been open

to extensive-sourcing decisions and off-schedule service.

British's record in the past has not been successful. The Britannia staff is two years behind the schedule BOMC originally set for it. But Macfield is determined to change all that.

"We will set delivery dates and meet or beat them," he says. "And we are determined to beat the airlines up with the best off-schedule service available anywhere."

A spare depot would be set up in Washington or New York to support the Capital purchases. An upgrade training school for flight and ground crew has been established at Bristol to train for the growth of Britannia purchases. Organization of worldwide technical support is underway.

To the next peak was in late April Capital, Macfield offers a very specific delivery date: April 27, 1975.

The Bristol managing director believes the evident potential for the Britannia lies somewhere between 100 and 400 aircraft. The company's brochures point he estimates, is 80 aircraft. The Capital side, together with other airlines under negotiation, will put Bristol very close to that figure.

## Britannia Family

Then, at the Britannia which the company will produce:

- A310, 100. Powered by the Bristol Proteus 735 turboprop engine with a total open-rotor horsepower of 3,750, gross weight of this aircraft is 115,000



FUSELAGE SECTION with other main assemblies (above) before assembly into single unit. Upper crates across peak which gun fuel and air baggage has set to go into position. General view of

airframe assembly hall (below) showing internal structure of a number of fuselage sections in center. At top can be seen windows in which various fuselage sections are first assembled.



BRITANNIA WING ASSEMBLY is of low cost construction. Engines (right) have low drag cowling.



the 114 is a 149-hp wingless, 114-hp. Gearing at 575 mph, it can carry 90 passengers. Still, air cargo rates maximum payload is 3,370 lb. BOAC ordered 15.

• **ML 270.** This is a combined freight-passenger aircraft similar to the 300 series. There have been orders by the Ministry of Supply and not by the Royal Air Force.

• **ML 300.** Engines for the 300 series are Proteus 755 which will turn out 4,112 total equivalent horsepower. Fuselage has been lengthened 10 ft. The 300 can carry a greater payload than the 100 over similar ranges. Gross weight is 165,000 lb. In addition to the passenger seats, seven have been ordered by BOAC.

• **ML 316.** A long-range aircraft designed to provide morning service to both directions over the North Atlantic, the 316 has a 175,000-lb. gross weight and carries 8,488 imperial gallons of fuel compared to 4,670 for the 300 series. BOAC ordered 15. FI Al Intel Airlines ordered three with an option on six, and Canadian Pacific ordered five with options on five.

• **ML 315.** The medium-range aircraft, based on Capital specifications, will be a ML 310 with weight reduced by omission of long-range tanks and reduction of fuselage and wing span. It also will be provided with various quick turn-around facilities such as an integral door.

• **ML 400.** Fuselage of the 400 will be 30 ft longer than the 310. It is longer than the 100. B.E. 23 turbo-prop aircraft will provide full 4,000 hp up to 35,000 ft., enabling the aircraft to climb from major airports at any altitude in any temperature without aerodynamic penalty. An extended leading edge will increase the lift to give the effect of a thinner wing, resulting in an increase in lift of 10% at 40,000 to 45,000 ft. To get the utmost out of the Britannia design, Bristol now set back its proposed 700 mph 130-jet engine Type 317.

"We will stretch the Britannia to the limit before going on to a new airplane," Macfield says.

#### Sales Confidence

Bristol is confident of a market for the Britannia. Sales Manager Roger White-Smith sees it this way. The Britannia will be the only airplane available to fly the Atlantic non-stop commercially in both directions in 1957. It will make a lot of money for its owners, when jet comes in on the transatlantic route, the Britannia will have been in service for almost three years and the high standard of work build will be complementary to this plan.

"If we accept it all that," says White-Smith, "we are the only aircraft in the business—that's the market."

The economy and quiet operation of the Britannia engines are key selling points in the Britannia's favor. It is without doubt one of the quietest aircraft in the world. A recent test by the Royal Aircraft Civil Air Board verified that during a Britannia visit to Stockholm-Bromma Airport. A noise level check made on takeoff showed the Britannia quieter than a Douglas DC 3 and well below the DC 66.

#### BOAC Plans

BOAC planned to put its Britannia 100s in service between England and South Africa, in early July. Engine fuel-system problems now set the service back to August 14th. May 14, p. 103. The schedule call for extension of service to Australia in September and to the Far East early next year.

The airline began to begin operation of its long-range 310s over the North Atlantic during 1957 and may use them to replace its South American routes, which was closed after the de Havilland Comets were withdrawn from service.

BOAC's deputy operations director, H. G. Becher, says company pilots have been very well pleased with the Britannia's performance during test-flighting. "The 310 meets all the performance standards very well," he comments.

#### Britannia Troubles

Like other aircraft, the Britannia has had its trouble-making moments. Latest occurred two weeks ago when it was discovered the Proteus 755 was susceptible to laminar flow control system wind tunnel tests.

Like also forced temporary grounding of the Britannia earlier that year when BOAC pilots found controls forcing under cold weather conditions. This was traced to an accumulation of moisture in the tail control. BOAC says the difficulty has been solved.

"We've spent four proving flights to Johannesburg without incident, in fact for the Britannia," Becher reports.

All anti-icing flights arrived on schedule at Aberdeen, Becher says.

Capt. A. S. M. Rendell, flight representative of BOAC's Britannia fleet, says cockpit visibility is better than the Lockheed Super Constellation and de Havilland Comet although not as good as the Boeing Stratojet.

#### Production Plans

Final assembly lines for the Britannia are at Bristol's Filton plant and at Short Bros and Harland in Belfast. Belfast Macfield believes capacity at these two plants will be sufficient to handle any increase in production in production.

Short now is building 24 Britannias. The first ML 300 from the Belfast plant is scheduled to fly in October of this

year and the first ML 250 in June, 1957. From then on, Short expects to turn out at least two a month. Long-range plans call for one a week.

A new 52-44,000-lb. plant already under construction at Belfast exclusively for Britannia production, is due for completion late next year.

The present schedule at Filton is for delivery of 12 Britannias this year, 14 in 1957 and 16 in 1958. New orders will, of course, change this program. Delivery of ML 100s is to be completed by March of next year. First ML 300 is scheduled to fly in June and the first 310 in December.

#### Subcontracting Helps

I. A. Becher, chief production engineer at Filton, believes Britannia production could be stepped up to 40 a year with the aid of subcontracting. The two plants that could turn out more than 90 aircraft a year, sufficient to meet demand in the immediate future.

Subcontracting is needed further on the Britannia than on any other U.S. aircraft. Possibly as much as 90% of the structure is subcontracted. In terms of man-hours, subcontracting totals 58%.

Apart from major subcontractors, Bristol itself builds only the main wings and leading edges of the Britannia. This extensive subcontracting is made possible by the unique panel construction employed on the turbo-prop aircraft. Section cowls for use of panels the laminate to British construction. "There is no question about the time saving," he says. "We get out of the major assembly job much faster than possible otherwise."

#### Panel Construction

The Britannia fuselage is made up of 15 panels, built individually at panel shops. These wings, nose, rear fuselage and up to 24-ft. long. Each panel is built complete with frame, stringers and skin, including windows where required.

Panel assembly jig for the fuselage is a series of external rings and wooden formwork, a very simple job. The panels are fastened to the inside of the rings and then joined. This is the only fastening in the fuselage.

"One result is that we get no cracks in joints," Becher points out. "Working from the outside in we do, the skins always make fast when fasteners contact an inner ring."

The final version of the Britannia fuselage was obtained since that anything else by the design to go to square nothing for a good finish.

"We had to correct the assemblies to a size to fit into the jaws of square

cutting machines," says Maurice Tamm, technical designer. The ultimate span-shaping technique made possible by the panel design does much to provide the uniform finish of the Britannia skin.

The wing of the Britannia is of box type construction, which Tamm believes to be the most efficient load-carrying arrangement for a wing of this thickness.

And since we need a thick skin for internal stiffeners, it is also efficient to make the skin load-carrying," he notes. The wing's single box type is an inherent design advantage to wings with no end-ribbing elements. This lack of elements offers big advantages both aerodynamically and logistically.

As few ribs as possible are used in the wing. The Bristol designers at last here and the engine nacelles as external stiffening ribs. This not only saves in weight saving but also reduces the number of gaps needed in the wing tanks.

Loading and trailing edges are entirely secondary, structure and chord was still over. Another structure gain is achieved from the fact that the thickness chord ratio varies from 11% at the tip to 17% at the root.

Vertical and horizontal stabilizers are of single box type construction similar to the wing. The horizontal stabilizer is a continuous top-to-top structure having low flow attachment beneath the leading edge. While the fin is basically a box structure, it changes to a two-part construction at the base, where it fastens to the main frame. Flying controls are of single span construction with chordwise stiffeners.

Radius radial housing is used extra such as the Britannia to eliminate rotating, spread loads and lighten construction. It is used on leading edge doors, wing ribs, gear wells, pylons and bulkheads tail fin and wing control surfaces.

Top and bottom panels of the Britannia inner wing are built complete with structure. These three are used in a bearing rig, where pre-drilled pins and longpins are installed. From the bearing rig, the wing goes to an assembly jig for subjoin of nacelles, landing and trailing edges. Chatter wing is fixed but not moved until later for space reasons.

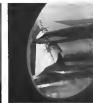
#### Nacelles

Nacelles are of monocoque shell structure. In the Britannia 100 series, there is a tapered shell bulkhead and a steel shell behind it for additional fire protection. Jet pipe trays and tail structure also are of steel. On the ML 310 series all fins will be titanium.

Alan Simms, Britannia development manager, notes that the nacelles are mounted so far forward that in effect they are almost pods. The engine is



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**FUSELAGE** does panel construction. Two panels make fuselage circumference.



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Lockheed C-130 A-10 Automatic Pilot



Douglas A3D A-3 Automatic Pilot



Boeing B-52 A-2 Automatic Pilot

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Sperry's experience in designing and building flight control systems for multi-jet aircraft has enabled Sperry engineers to design the new SP-30 Flight Control System to meet the requirements of the air-liner of the forthcoming jet age. This system is based on an entirely new concept of flight control.

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Later models were designed for many military applications in high-speed jet and turbo-prop

aircraft. By working in close cooperation with the factory and the design groups of Boeing, Douglas and Lockheed, Sperry developed flight control systems for the B-47, B-52, A3D and the C-130. Thousands of these aircraft are being flown today by these flight control systems.

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well ahead of the main structure. Heavy needle sheet leads are taken out through front and rear gate frames. On rolling movement a valve cut cleanly into the line.

### Assembly Schedule

Final assembly of the Rotamex goes like this:

1. The port wing is placed in a per moment cradle.
2. The reinforced wing and fuelage sections are an movable cradle.
3. The wings are joined to the center ribs and the center bracket is dropped into it. (In the Rotamex, wing tension loads are taken out in the open and from the wing skins through longerons.)
4. The front fuelage and nose are now an attached. The rear fuelage is mated a work later.
5. The left panel is added, followed by the right.
6. The fuselage is next.
7. The aircraft is situated over on a turntable, underweight for later addition of mechanical stabilizers, electrical and hydraulic systems, flap, flap control, undercarriage and other items.

In view of this unusual manufacturing method and the concrete reference testing of scales possible, it is publicly stated that the Rotamex will set up a U S-type assembly line.

### Proton Engine

The Proton 755 engine which powers the MK 180 now has more than 50,000 hrs. of bench and flight testing behind it, including 15,000 hrs. of flight time.

More than 100 of the engines have been built and tested. Airspeed Ltd., the Bristol engine subsidiary, reports excellent performance records. To keep up with customer demands, the Proton 755 will have a new reduction gear and gear power.

Chandler-Evans, as the Proton at present is 510 lbs., but the company hopes to have this up to 450 lbs. by the time the BAC Rotamex goes into service in Jan., and up to 1,000 lbs. within two years.

Behind behind the six turbine principle of the Proton engine, in which two turbine stages drive the compressor and drive the propeller, goes a gearbox, constant and flexibility furnished by fixed rate turbo-prop.

Since the turbine can be used by the gas stream, the pilot can view his propeller spin without having to look through a viewing window or prism.

It also has the advantage that a windmilling propeller will stop since it does not have to turn the engine. It also has engine-out performance even, in fact, as based on a windmilling, not a feathered prop. There is no need for separate feathering device.

The pilot can feather at his leisure

# At Your Service... Hydrospin

A few of the typical shapes of metal parts which have been Hydrospun



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A Chandler Hydrospin machine is now in operation at Kaiser Metal Products, Inc., and is available to metals, jet engine and other manufacturers for development and production work.

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### Savings Take Many Forms

Forming by the continuous method obviates many clip cutting operations with resulting savings in labor, material and machine time. One manufacturer has made savings of 100 lbs. of material high temperature alloy in one part engine part alone. Another development on a metal part shows savings of 40% in material cost.

Design Engineers: Take advantage of controlled wall thickness possible by the process and consider redesign for ultimate strength and weight savings.

**KAISER METAL PRODUCTS, INC.**  
BRISTOL, PA.

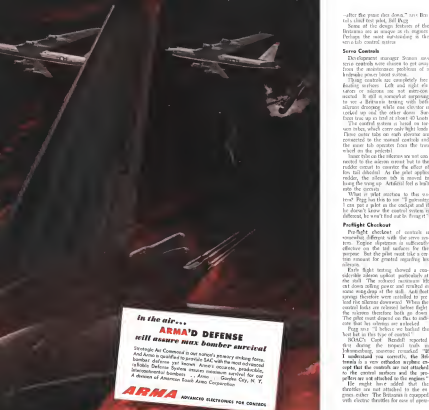
draw die method and turn weight of the finished part by control of wall thickness.

A wide range of metals has been successfully Hydrospun, as the above photographs show, an unlimited variety of outside, curved and hemispherical shapes is possible. Ask us about ways to put this Hydrospin to work for you in solving your manufacturing problems on load-carrying, highly stressed parts. We can show you how to produce a better part at a minimum cost saving. Write for brochure today. Address Dept. A.



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**ARMA**

ADVANCED ELECTRONICS FOR COMBAT

—after the plane dies down," says Bragg's chief test pilot, Bill Pegg.

Some of the design features of the Britanna are as simple as its engine. Perhaps the most interesting in the service control system.

### Service Controls

Development manager Scam says service controls were chosen to get away from the maintenance problems of a hydraulic power boost system.

Thrust controls are completely free floating valves. Left and right elevators or ailerons are not interconnected. It still is somewhat surprising to see a Britanna testing with left ailerons drooping while one elevator is reeked up and the other down. Sometimes it's up in front at about 40 knots.

The control system is based on tension tubes, which carry only light loads. These center tubes on each elevator are connected to the manual controls and the service tube operates from the trim wheel on the pedestal.

Lower tubes on the ailerons are not connected to the aileron control but to the rudder control to counter the effect of low tail deflection. As the pilot applies rudder, the aileron tabs are moved to bring the wing up. Artificial feel is built into the controls.

What is pilot reaction to this system? Pegg has this to say: "I guess you can put a pilot in the cockpit and if he doesn't know the control system is different, he won't find out by flying it."

### Pre-flight Checklist

Pre-flight checklist of controls is somewhat different with the service system. Engine operation is sufficiently effective on the tail surface for the purpose. But the pilot must take a certain amount for ground handling his ailerons.

Early flight testing showed a considerable increase in pitch rate at the stall. The reduced maximum lift at down rolling gave a result in some sagging of the stall. Anti-stall springs therefore were installed to pre-load the ailerons downward. When the control tabs are released before flight the ailerons therefore back on down. The pilot must depend on this to indicate that his ailerons are unlocked.

Pegg says: "I believe we backed the feel but in this type of control."

BRAC's Carl Randall reported first during the tropical tests in Indianapolis, summer 1964. "I understand you correctly, the Britanna is a very orthodox airplane except that the controls are not attached to the control surfaces and the servos are not attached to the engines."

He might have added that the direction are not attached to the engines either. The Britanna is equipped with electric thrusters for use of opera-

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VERONIQUE cradle shows exterior detail and construction of the high-altitude French rocket.

## Delta Fin Veronique Aims At 137 Miles

By Frederick I. Galsway, III\*

Verone, France—A coding of 137 mi is the target range for development of the Veronique high altitude rocket, the largest post-war effort of France and Western Europe.

During the on- and off-pieces with the rocket, the movement altitude reached has been about 80 mi. The success of the test brings has spurred development of the fabric model aimed at a higher coding.

Early models were fired in France, but more recently flights have been made from the government proving grounds in Colomb Bechar, Algeria.

Successful Alt. Proven. Coldest. Active. Active. Active.

The Veronique originally resembled a German V-2 in general form, but later models used a changed fin design with delta surfaces replacing the original ones of the V-2. Decent height of the rocket is 24 ft, and its diameter is less than one foot. Gross weight is about one and one-half tons.

Veronique was developed by the Aerospatiale and Ballistic Research Laboratory in Verone, part of the Directorate of Armament Research and Development of the Ministry of National Defense.

### Stabilizing System

Veronique is a fin conventional rocket, one of its products is internal and cable control. Four cable an-

tennae extend from a drum located under the platform from which the rocket is fired. Outriggers extending from the rocket's fin support these cables and maintain the stability until the rocket's upward motion is sufficient to allow veronique's fins to effectively act as the control surfaces. Cable control altitude is about 180 feet, from here on the rocket enters a free ballistic trajectory. Clock-controlled engines both report the progress of the proper time.

No protection need be taken for differing cable motion since all cables extend from the same drum, which is protected from the blast by jet deflection. The rocket's fin can be proved by making two cables a bit shorter than

the others. It is also possible to make the launching platform slightly to one position for wind.

A number of Veronique flights using this technique have been made, as 22 gms, one of which reached a record altitude of 84 miles, close to the missile's calculated ceiling.

### Recovery Techniques

Instrument return is made by a plane separation of the nose cone, which is coupled with a drag and parachute model descent. Though the recovery technique is very useful, a majority of the information desired is transmitted to the ground station following aerial separation, the nose cone falls toward the earth at about 160 mph. Before impact, a hollowed capsule sets off a second series of parachute balls which maintain parachute descent.

The model's solid rocket develops nearly 9,000 pounds of thrust burning Diesel oil and when firing time ends and is fired by a hypersonic spin-down inertial clock. Some recent tests have employed a magnetic fuel with a solenoid magnetism in specific engine.

The Veronique dates from 1949 and has recently been awarded a national status, providing a larger firing base.

Tests are carried out later models are pointed in the accompanying table together with technical figures for a proposed fabric model.

The Veronique brings new emphasis of the "recovered" series, R-1 to R-5 and the "normal" series, N-1 to N-15. The cable series had short firing time and were used principally to check and timing and cable distribution techniques. The N group of the second



POWERPLANT of the Veronique gets a preflight run on the test stand at Verone.



LAUNCHING VERONIQUE: The rocket, with cable stabilizer attached, made up its firing table in the center state.



OUTRIGGERS carry the pressure cables, both very early in the flight to have the Veronique angled for the test.





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If you have an assembly you're thinking of subcontracting, call Twin C-400 Aircraft Division. You'll be secure in the knowledge that your assembly will be built by *aviation specialists*—by men whose sole aim is to build to specifications . . . on schedule . . . at the lowest possible cost.



TWIN COACH COMPANY

**Abstract**

Silver deposits at Fort Creek, Colorado, and

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### Performance Data for Veronique Missiles Fired

[illegible]

series had a design firing time of 32 seconds. Target period of combustion of the NA model was at least 40 seconds.

## Learning Objectives

**Verrepsco** is a dark, transparent, and its launching base, which can be built as a self-stick, flat surface measuring approximately 30 by 85 feet. A simple, easily set-up launching structure, is required. A complete Verrepsco is estimated to cost a little over \$14,000, a full load of propellant adding another \$200.

It fits into a special race 16.7x30x59 ft. A maids and its accessories can be set up relatively rapidly, requiring a day for unloading, two for setting up, and two more days for making all additional preparation (transportation, discounts, controls, payload loading, etc.).

Contrary to previous plans, it does not appear that Veronique will be held in cooperation with the 1957-58 International Geophysical Year. One reason may be that French participants

in the KGV have revealed the great concentrations of valuable funds on such areas as geometry and oceanography, leaving rocket exploration of the upper atmosphere largely to the U.S. and perhaps also to Russia and Britain. There are efforts being made in France to make a somewhat concentrated effort in

The Anandamang and Balaia Research Laboratories are located on a flat plateau overlooking the town of Viroon in the department of Evreux, one hour from Paris west and north from Paris. Viroon is on the Seine river

## THE VERONIQUE MISSILE

ITEM	Type I Early Model	Type IIA Late Model	Percent Future Model
Length, ft.	31.6	34	34
Diameter, ft.	1.8	2.8	5.8
Lowest Weight, lb.	2,140	3,180	2,930
Projected Weight, lb.	1,580	2,140	3,100
Payroll, ft.	123	133	133
Stress, lb.	2,800	2,830	4,610
Flying Time, sec.	21.5	45	48.5
Mainstream Speed, mph.	3,800	3,800	4,000
Accelerations, Gm. 1 g.	7.5	8.2	10.5
Altitude (miles), miles, (estimated)	44	84	
Casting weight	50	90	137



## RADAR MAPPING



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not far from Moscow, and is typical of terrain in the old Russian province.

The laboratory grounds are completely closed in. Rows of six to seven dormitories, the so-called "cubes" of the base. In addition to the principal offices, there are the computer facilities, scientific laboratories, machine shops, test pits, propellant storage, facilities engineering buildings, interior firing ranges and wind tunnels. The laboratory complex about 1000 persons and is administered by 44, 1-man-a-day.

The Laboratory de Recherches Hydrographiques de l'Armement was created shortly after the war and plans were laid for its construction in 1947. Actual building began towards the end of 1948, and the base went into operation several years later. Besides work in guidance and propulsion, the laboratory has a very well-equipped machine section, which has been in operation since 1952. Its equipment includes a number of small wind tunnels, a large closed-circuit supersonic wind tunnel and a ballistic firing range.

### Wind Tunnels

Three small supersonic wind tunnels allow preliminary tests to be made non-simultaneously. One of these is vertical, small, supersonic shapes can be projected upward, throwing a number of measurements of ballistic behavior to be made. These small wind tunnels have test sections 3 in. square. Two more level beds with a total volume of 12,500 cu ft can be exposed of 99% of these are less than three minutes, 200 hp pumps are used in this operation. Air is drawn upon entering in a closed compressor.

The larger tunnel occupies the main area of the base, which opens, either in parallel or in series, and which is driven by 25,000 hp electric motor. An air conditioning plant consisting of vacuum pumps, oil-cooled drives and piston compressors drives the air. Major characteristics include Mach number range from 1.4 to 4.4 test section pressure of 14-100 psi, and a 30 in. by 10 in. test section. It is equipped with numerous separate movable blades as placed ahead of the test section, change of nozzles can be made in five minutes. Wind tunnel air temperature and pressure can be adjusted easily by raising the vacuum of water introduced by its air intake and by adding air. In so doing, air conditioning means are avoided, data being corrected and transferred to a punched card system. The test flight firing range is 305 ft long, has a 18 x 107 ft section and is equipped with photographic cameras.

Up to ten electronic computer test sets are also available at Vernon and both laser and ground simulation are

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*for JETS and MISSILES*



ALL-ANGL Mounting gear with base of relay installed assembly for 100 Duplex 0 view of Carl's Electric Company for P 80 and P 100



The attitude guru of North American Aviation's P-100 Super Sabre must give reliable indication through every flight attitude — or the pilot won't know which way is up.

That's why ALL-ANGL Barry Mounts are chosen to protect the delicate sensing relays in the interlock assembly for this vital instrument. Close-tolerance operation in all attitudes demands the certain isolation of vibration — assured by ALL-ANGL Barry Mounts.

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- 2 Short leads capture long air line pulls.
- 3 Short leads capture long air line pulls.

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LINEARITY: within 1% up to 4 vols; 2%  
up to 10 vols  
MAX DETAIL: any value up to 10 vols  
EXOTATION: any value up to 114 vols  
single phase  
HORIZONTAL and VERTICAL: as low as  
1/10000 mm, x-yle

**RESOLUTION** up to 1/400 mm/corr.  
(200 lines/mm)

**LINEARITY** as low as  $\pm 1\%$  full scale  
(Function of resolution and size)

**NOISE**  $\leq 0.5\%$

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anyone line width—off-gy on line  
then resolution utilization

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**GYRON**

● 参考文献: 高玉生, 张永成. 2004. 中国城市人口空间均衡与区域可持续发展. 北京: 中国人口出版社.

STABLE PLATFORM + FREE QTY

## DYNAMICS

A DIVISION OF GARCO INDUSTRIES, INC. • EL SEGUNDO, CALIFORNIA

## A black and white photograph of a woman with dark hair, wearing a dark, off-the-shoulder top, sitting at a large, vintage computer terminal. She is looking at the screen and has her hands on the keyboard. The terminal features a large, circular screen at the top, which appears to be a CRT monitor. Below the screen is a large, rectangular panel with many small, square buttons or indicators arranged in a grid. The woman is positioned on the left side of the frame, and the terminal is on the right. The background is dark and indistinct.

POLSKA CONSULE, port of departure, traffic control request

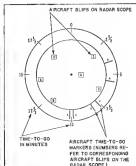


Illustration shows two-to-one workers as related to solar flares

## By Patricia J. Kline

Kansas techniques could solve the pressing Convention Center traffic control problem, but despite the expense, highway engineers see little hope for a technological long-range solution. That is, unless all highway users agree on a national policy which scientifically defines the basic problem and its approach to its solution. Givens emphasized that these engineers were his own, not official Air Force ones.

Greene said that these developments were under way as part of the USM integrated TRACALS program (Traffic Control And Landing System) being conducted by the MoD and NASA.

• The route traffic flow computer designed to schedule automatically the vehicle flow, when route traffic reaches the

• **Digitaltype:** Volcan scheduling, which will be able to compute resource changes at aircraft speed as well as loading. (Present Volcan design relies solely on change of aircraft location to bring it in at correct time.) New digital version, being developed by the Birmingham Corp., also will allow increased scheduling flexibility, provide for both takeoffs and landings.

- Some autonomous traffic manager components which enable greater control to avoid blocking of service if they enter a Volume controlled and (QoS) mode (e.g. Diffserv). Can be used to manage flow, who reports and manages

One of the problems Greene said which might prevent the application of the air defense radar network and SAGE

Another problem is that two aircraft at different altitudes and ground distances from the radar may have the same slant range distance from ground radar to implies occurrence along a line connecting the two. Thus the two aircraft would appear as each, consistent steps on the PFI despite considerable actual separation.

Aircraft traffic control respondents, which identify each aircraft by its on the scope and can be used to transmit back to the ground the aircraft's barometric altitude, might use these problems and make SAIL suitable for Common System use.

But Gianni believes there is a definite need to obtain as direct data as possible of clients' sales as the primary data source or as a backup for data obtained from grossed sales. Access to being-direct information obtained from an upstream TMS or VDR DMS.



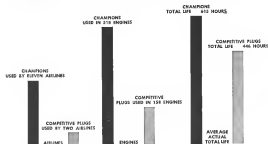
TO ALL EXECUTIVE AND

*We know how much you respect the experience equipment. Here are the facts . . . supplied by the plugs, both for the demanding turbo-compound*

## TURBO-COMPOUND ENGINES

Action	Type	No. Aircraft	Spork Plug	Engines Using Only Chaps	Engines Using Other Plug
AMERICAN	DC-7	27	Champion	108	....
DELTA CAS	DC-7	10	Champion	40	....
	DC-7	9	Other	....	36
EASTERN	41049C	18	Other	3*	54
NATIONAL	DC-7	4	Champion	14	2*
NORTHWEST	41049D	4	Champion	16	....
PAN-AMERICAN (Atlantic Div.)	DC-7	9	Champion	36	10*
TRANS-WORLD	41049D	20	Champion	80	....
UNITED	DC-7	35	Champion	100	....
WLM	41049C	12	Other	3*	46
AIR TRANCE	41049C-G	18	Champion	69	3*
TRANS-CANADA	41049C	7	Champion	28	....
SEABOARD & WESTERN	41049D	4	Champion	16	....
LUFTHANSA	41049C	4	Champion	16	....

<sup>a</sup>Evaluation Test



### PRIVATE AIRCRAFT OWNERS:

*of the major airlines in selecting the best flight airlines themselves<sup>1</sup> on their choice of spark engines and other reciprocating engines.*

<sup>†</sup>As determined by survey, September 1, 1953.

#### AIRLINES USING CHAMPION SPARK PLUGS

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You Want The Same Safety And Performance The Airlines Demand . . . Make Sure You Get It! Specify

## Champion Spark Plugs!



## FASTENER PROBLEM

Thread Size	Size No.	#s per C	Size No.	#s per C	Size No.	#s per C
4-40 UNF-30	M-43	18	M-43	18	UNF-40	18
5-32 UNF-30	M-42	28	M-42	28	UNF-42	22
6-32 UNF-30	M-42	42	M-42	42	UNF-42	28
10-32 UNF-30	M-42	50	M-42	19	UNF-42	25
M-28 UNF-30	E-64	90	M-64	38	UNF-64	28
M-24 UNF-30	E-64	120			UNF-64	44

## How weight conscious are you?

Weight reduction is a constant goal among aircraft design engineers. But no point is weight saving, if, when it comes to fasteners, there are applications where factors of safety, performance and cost must take precedence over weight. In your specific fastener problem, is lighter weight a priority? Or can you afford a bit of weight penalty to accomplish a cost savings? Are high temperatures a design operating problem?

### SOLUTION:

Whether your design requirements are, the ESNA line includes a fastener to meet them. For instance, there are three basic line, and type:

- Lowest in cost are the standard parts with low to no torque (Type M). A standard in the industry for over 20 years. These offer the best weight/moment of stress, design and application possibilities for any self-locking fastener. (Temp. to 250° F.)
- Next in cost and higher of self locking has not in the blue steel (Type L). It has high strength aluminum alloy. They are qualified to meet the same AN requirements as the two steel nuts above. (Temp. to 250° F.)
- Third in the line, ESNA LITE-TM line of light-weight all steel nuts, available for use at temperatures up to 300° F. These nuts have been considerably lightened... considered with safety and performance considerations. Conforms to AN-444 and nut lengths, will meet oversize requirements for full height AN-305 parts.

ESNA can supply the highest... or the most versatile and economical... or highest temperature self locking nuts available. And all of these meet ESNA's rigid quality standards. Select the right fastener for your application—and be sure it's an ESNA Step® nut.

### MAIL COUPON FOR DESIGN INFORMATION

ESNA, Inc., 11111 1st St., San Diego, California 92121

Please send me the following free literature information:

☐ Basic Step Nut Information ☐ How to do a drawing of my product

☐ Drawings for types M, L, and LITE ☐ What self locking fasteners would you suggest?

Name \_\_\_\_\_ Title \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



plus thermally stable, can be transmitted, and, again, in ground vehicles by means of a data link system. Although Gossard did not discuss details of the data link technology, it is known that it uses radio frequency for data link transmission at aircraft being designed and already built in ground stations. The Air Force has some experimental means data link systems under development.

### Volvo SAGE Ties In

MCRC's Navigation Laboratory, Gossard, said, expects to install one of the new production prototype VolvoSAGE (produced by Aero Manufacturing) at its Fort Belvoir, Mont. facility next year to see how well it can be integrated with the SAGE system and Boeing Air Route Traffic Control Center operations.

Under Air Navigation Development Board sponsorship, MCRC is installing a 1200 line closed circuit television system to monitor the feasibility of receiving SAGE radar scope presentations with the Boeing ATRC. The 1200 line resolution compared to only 525 lines (as in commercial TV) is necessary to provide good definition of the very small aircraft identification code letters which appear in the line of the SAGE Characteristic code scope (AWJ 90 p. 45).

The Air Force plans to test these prototype VolvoSAGE systems at a number of sites. One will be installed at MCRC, then moved to Clinton



### Jet Engine Simulator

Using computer designed by General Electric, will enable the company's Avionics Co. to design a jet engine for use in jet engine design, a wide variety of flight conditions, growth reducing time and cost of engine development. Designed under Air Research and Development Command sponsorship, the computer was 6,000 tubes and costs a floor area of 2,435 sq. ft., making it one of the world's largest analog computers, according to GE.

Gossard Airport near Dayton has opened a station. After this it will be returned to MCRC for SAGE team tests. A second station will go to the Air Force Command base at Ft. Belvoir, Mont. after which it will be installed at an Air Defense Command base. The third is scheduled for installation at WADC.

### Traffic Manager

In connection with Air Force Work, Gossard said that MCRC expects to launch a development program for a new automatic traffic manager computer which will be installed in the future. The first of a series of aircraft approach and departure control systems is being developed. The first of a series of aircraft approach and departure control systems is being developed.

The VolvoSAGE system is designed to take into traffic flow control of a number of about 60 aircraft, but if a number of aircraft enter the control area simultaneously, some will have to be delayed. This new system, as well as the current system, Gossard and his co-workers believe, it is better to take that delay factor out.

Here it has the air, there would appear. When it is used, approaching the airport is picked up by the ground radar (20 miles out), a tracking computer will be assigned to follow it automatically. At the same time, a computer will calculate automatically and continuously how long it will take the aircraft to reach the 10-mile VolvoSAGE control radius.

Each airplane position will be indicated on a radar scope by its identity, its number, and the position of the scope will be under computer which will display its position, its level, its heading for each aircraft in the VolvoSAGE 60-mile control radius. (See sketch p. 65.)

Any heading of low-frequency stations around the perimeter of the scope, usually, since the ground controller to space and the aircraft.

The time device could be used in airports not equipped with VolvoSAGE. In such the computer to calculate time to the approach gate of the jet port.

Gossard said that MCRC expects to let contracts for several prototype models within fiscal 1977 funds become available.

### Fast Mistakes

In Gossard's opinion, present air traffic control problems stem from basic shortcomings in current design. • Working for the future, Gossard said, some airports may have been in fact to get present techniques and equipment to work in the expectation that a better system is just around the corner.

• Inefficient effort devoted to problem

Gossard believes the U.S. is using only one-third the number of aircraft and development people and half the operational people, compared by the magnitude of the problem. "We have to go for a solution to the traffic control problem with more and facilities," he said.

• Failure to see problem as a whole. The air traffic control problem involves the airframe, power plant, engine location, and weather considerations, not just aircraft equipment. "There have to be more in another aspect without considering the traffic control problem as a complete solution," Gossard said.

• Inadequate knowledge of the problem. There have been numerous studies of the air traffic problem, but these can lead only to patches on patches. What is needed, Gossard believes, are scientific studies and computerized experiments using actual aircraft and systems. Only in the U.S. can we find how accurate a navigation data need be, whether air control is possible, to direct control, and the relative merits of ground-based navigation versus space navigation.

"We have the techniques today," Gossard said, "which can take almost any traffic control problem we can ask, solve it."

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- Burroughs Computation plants in Detroit and Plymouth, Michigan
- Burroughs Research Center, Fort, Pennsylvania
- Burroughs Electronic Instruments Division, Philadelphia, Pennsylvania
- General Instruments Company, Brooklyn, New York
- Hepko Brothers of New Jersey, Plainfield, New Jersey
- The Teled Corporation, Inc., Rochester, NY



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Solving in future expedience, Burroughs invites inquiries from qualified engineers.

## Longer Hours, Better Firm Use Would Speed Avionics Progress

Dayton-Laguer hosts for engineers better use of modernized computers and providing management control and some recommendations for speeding progress in aircraft and development work, but not at the National Conference on Avionics Electronics.

A seven-man panel of Air Force and civilian representatives had these suggestions for the aviation:

- Expand staffed aircraft research and development in components, technology and technical understanding.
- Robert J. Shook, vice president of Hughes Aircraft Co., Shook said the military should recognize the complexity of design changes.
- Make better use of modernized systems computers with specialized knowledge in modifying some present weapon systems, communication practices.
- Dr. Carlo Berio, director of engineering, research and development for the Air Force Research Office of General Motors.
- Adopt more flexible research policies to give scientists' maximum freedom of approach in solving problems with less rigid timetables and without requiring delivery of an end product.
- Dr. Douglas H. Ewing, vice president in charge of Radio Corporation of America's Arnold Research Laboratories.

### For Industry

There were three recommendations for industry organizations:

- Expand management control and thorough planning in industry on each R&D project.
- Ray. Gen. Victor H. Blum, deputy commander for design

and Night Air Development Center.

- "Don't put too many men on a job."
- William H. C. Higgins, director of military electronics, Ball Aerospace Laboratories, Higgins noted that too many engineers on a job can lead to the explosion of too many different avenues of approach.
- Longer working hours for engineers and scientists possible up to 45 hours a week.
- Thomas M. Miller, president of Melpar, Inc., Miller said this could pay up to 25% more money in research with no greater end per hour.

### NACA for Aviation?

One of the most heated suggestions, raised in a question from a member of the audience, was the possibility of setting up a basic research organization or laboratory operated by the government and dedicated to the general aviation industry.

In a similar vein, Dr. Ewing suggested that it might be desirable to set up a control agency for all aviation services which would support long-range basic research. This agency would sponsor research which "is groundless," which therefore is exploration or discovery. "What we need is not to immediately approach (but) what we cannot progress further in the future."

Failure to get sufficient effort into work of these developments, is difficult to obtain from those concerned for a specific weapon can be a major cause of delay in weapon system development. Shook pointed out.

A system consisted to develop most at a technical level where the state of the art cannot support it can undergo a long and painful process of trying to drag the state-of-the-art along with great discomfort to the program budget, and no individual or company is responsible. Shook said.

### Changes are Certain

On the other hand, if a new system does not fully exploit the state-of-the-art, it is not only a waste of money but it is not good for the job, he said.

Delays involved in improving the state-of-the-art appear to be the most probable delay, he said.

Shook said "At the present time there are few to make it, until they can be attached to some specific item and special papers."

Present aviation requirements are so different and the systems to meet them so complex, that even the best design team planning cannot put an equivalent into the production application phase without running the almost certain risk of major changes. Shook said.

Changes need not be catastrophic and they need not disrupt other manufacturing or service maintenance organizations, if companies will give their attention to the availability of changes, he said.

The scientific talent and capability of present limited man-machine systems computers are not being put to most effective use because of "growing pains" type problems associated with the Air Force's weapon system management concept, he said.

A large percentage of the modern systems computers (1,000 to 10,000 man pieces), more of their role in the present system picture, find themselves struggling to handle the large volume



New HF Antenna

New type of HF antenna, an insulated probe (over), is mounted atop the vertical tail of the B-57C prototype. It is being evaluated as a possible replacement for the isolated tail-type type of both antennas. Research modified for L-30 aircraft also is under evaluation. Preliminary tests indicate the probe antenna is effectively as well as mechanically superior to conventional antennas.



**EXHAUSTIVE TESTS** on the General Electric T48 turboshaft engine have been conducted to prove its basic design and to assure top performance and reliability. Results show that the advanced design features of the T48 point to vastly improved helicopter performance.

GENERAL ELECTRIC

## Tests on G.E.'s New T58 Engine Point to Major Advance in Helicopter Flight

General Electric's T58 turboshaft engine, now on test for the U.S. Army Bureau of Aeronautics, represents a significant step forward in the art of small aircraft gas turbine design.

Incorporating many advanced engine-design features, the T58 introduces to the 1000-horsepower class a turboshaft engine with **low specific fuel consumption and an outstanding power-to-weight ratio**—advantages that truly forecast greater helicopter and fixed-wing aircraft performance.

The T58 also introduces a new concept in **constant-speed control** that provides a standard of operation unapproached until now. Designed to take full advantage of a

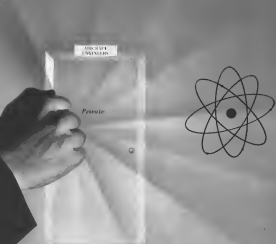
free power turbine, this new control permits operation of the helicopter's rotor at its maximum efficiency and eliminates the need for speed adjustment by the pilot during normal helicopter operation.

These are only a few of the features that make the T58 the ideal helicopter powerplant and another example of General Electric's ability to design and build for tomorrow's aviation needs. With fifteen years of experience in producing aircraft gas turbines of the highest reliability and quality, G.E. continues to set such standards as proof of its role in the progress of American aviation. Section 121-L, General Electric Co., Schenectady 5, N. Y.

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GENERAL  ELECTRIC





ARMY OF THE  
UNITED STATES

Private



## Atomic-Powered Plane Project Started by AF, Lockheed in N. Georgia

## Lockheed Gears Up For Atom Plane Work



panels, going after the large contracts, bidding on more things than they should, and running up the bill of costs, petitive looking to the point where it is a major shame for the government to give him consideration to fill in selecting the winner.

The spreading of which agencies a large effective loss of taxpayer and facilities to a military program. It goes up money which might better be put to exploring new solutions to our research and development problems.

Bessette recommended a ten percent program to make better use of medium-size companies from here.

• Raise the requirement that a good design system contractor be capable of handling as much as 50% of a job within its own organization. The requirement now encourages large companies to further expand the scope of their operations, fragmenting into a field where their management is not up to that available from sub-contractors.

• Reduce activities of medium-sized firms so that they become sub-contractors in the control of the government, instead of the.

"Most medium-sized companies would be happy to be selected of doing on large projects for which they are not completely qualified," Bessette said. "They could be a place more real check on technical proposals to the government on prime contracts if they knew that a careful pre-selection (or qualified firms) had been made and that fact put into as much as a 20% change of contract with each bid."

Bessette made a plea for bringing in sub-contractors during the



## Signal Corps Radar

Aircraft traffic radar display, developed for Army Signal Corps, shows each airplane under surveillance registered with a five-digit identification number, a velocity vector which indicates its heading and approximate speed, and an array of coded dots for indicating altitude height or other pertinent data. The device, developed by American Machine & Foundry Co., requires a Cassini-Chauvin tube. It is designed to accept such data in aircraft height, identification from automatic source or manual input.

A small fund which might be called "Ten targets of opportunity." Such funds could be used to support an increasing loss of research which turns up unanticipated, without having to wait up to 18 months until new local funds become available. The projects would be raised out of the "targets of opportunity" category as soon as significant funds become available.

## USAF Methods

Brig Gen Hagan noted these steps which the Air Force is taking to step up its efforts of its R&D efforts:

• Technical proposals and Technical Program Planning Documents released to selected in selected contractors are being reviewed to give industry advance information on Air Force plans and future requirements. The program will be expanded with the release of documents to other companies as they are cleared. With this information, USAF hopes that industry and science will take a "more active part in our exploratory development program and will support more of it from within their own resources," Gen. Hagan said.

• Search for streamlined procedures by which USAF can appear contractor's efforts. The objective is to hold the contractor responsible for the engineering required to strengthen the development for his contract and for to provide him with the authority to extend this responsibility. Gen. Hagan said.



## Low Drift Gyro-Compass

New Low Drift Gyro-Compass, Navy Type M-1, is out on General Electric and Atlas May 1954, has a drift rate of less than 1 deg/day, was 100% accurate and accurate regardless of heading, and weighs only 10.7 lb. M-1 can be rotated in approximately 10 sec as a "live gyro" at high latitudes. Developed under Bureau of Aeronautics sponsorship, the M-1 is being produced at Lear's Guided Missile plant.

## Personal Shirts

NCA's Strong urged that research projects be funded for more than the initial one-year period. "Funding and that more research programs could be used, even reaching a variety of agencies. Strong said that a company is reluctant to shift and align personnel to a new military research project when there is the possibility that it will be abandoned at the end of a year. Strong also urged the military set up



The rider wear-grade throat section is cast of aluminum by the Antioch Process\*. The specifications are rigid, but we meet them in production. Single center wheels only .012 thick—inside finish meets electrical specifications in-cast.

The piece weighs 20 pounds and stands a foot and one-half high. Bean specializes in casting wear-grade, impellers and other parts of aluminum to demanding standards. Write for the Bean portfolio of difficult casting case histories. Or send a post card for recommendations.

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\* Technical literature about the Antioch Process will be sent on request.

## antioch process casting



## FILTER CENTER

► **RCA Engineers Study**—More than 1,475 engineers of Radio Corporation of America are taking college courses outside working hours in order to improve their skill and expand plans. Under the plan, which cost RCA nearly \$175,000 last year, employees may borrow money to pay tuition for college courses which will add to their education. If they complete them successfully, RCA rewards the action.

► **Bolly Norton-Schuman**—Wallops (Virginia) Laboratories are studying "new radar techniques which can locate nuclear emitting capability of detecting arrival of missiles," as well as electronic devices which can be operated despite exposure to nuclear radiation.

► **Universal Trend**—The Space Guidance Company, Englewood Cliffs, New Jersey, recently won a large display at the New York Times through "sponsored" contest. The contest drew out the advantage of working for Sperry since these advantages and many more are guaranteed to be a legal contract. The Space Engineers Association, whose relations with the company have not always been harmonious, is affiliated with the Engineers and Scientists of America.

► **RCA Meetings**—Others that the of the largest in the history of the Space Assembly of the Radio Technical Conference for Astronautics June 5-6 Hotel Statler Boston. Topics scheduled for the RCA meeting include:

► **Inertial Guidance** report on inertial developments and their possible conversion to inertial guidance by Dr. Walter Wiegley, Massachusetts Institute of Technology.

► **Doppler Navigation**—reports developed Doppler radio techniques which hold promise for Common System use by R. C. Sanders Jr. president Stanford Astronautics Inc.

► **Operational Applications of SACG**—Dr. George F. Vukobratovic, director of MIT's Lincoln Laboratory will discuss possible use of SACG for Common System traffic control.

► **Inertial Guidance Addition**—To Antioch, Waco's list of U. S. manufacturers of inertial guidance systems and super sub-systems (AO) Jan. 73 a 70 should be added the name of White-Rodgers Electric Co., St. Louis. Company, reportedly, has tested a complete inertial guidance system in 1964, and expects to test more advanced systems soon. White-Rodgers also has supplied state-of-the-art in several inertial system manufacturers.

## NEW AVIONIC PRODUCTS

### Components & Devices

► **High-voltage electron multipliers**, single gain-position type, with 1,500 volt in-cathode voltage, for operation up to 150°C are available with heretofore unmet voltage up to 100 mv. Available in one or two different models 15015



and IN454A have small leads, IN454 and IN454A have standard mounting provisions for automatic test equipment. Model TL1040 comes in package case making it suitable for testing a JN 654 nuclear tube. Telsco Instruments Co., 9000 Lexington Ave., Dallas 9.

► **High temperature semiconductor pvt**, type N 506, measures 1 in. dia., can be operated over temperature range of -55°C to 150°C. Unit is available with resistance of 200 to 200,000 ohms, 2% tolerance, 0.1% resolution. Per package for, reportedly, more JAN and MIL-E-1773A types. See Electronics Associates, 107 Deane St., Somerville 44, Mass.

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Combining maximum reliability with light weight design... Norden-Ketay Pressure Ratio Indicating System provides you with the most accurate method of thrust measurement... means you can optimize engine in take off and full operation of engine. The unique evaluation design is here applied to other aircraft instrumentation and engine instrumentation, high accuracy altimeters and air data systems.

**ACCURACY**—0.01% pressure ratio at 100% temperature, 0.02% pressure ratio from -50°C to +70°C, ± .005 pressure ratio to 120°C.

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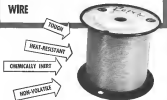
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INSULATED  
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Because of its extreme toughness, high heat resistance, and chemical inertness, Ravenhill's impaled wire is widely recommended for homeostatically sealed equipment: for devices operating with small gauge wire of high temperatures; and for conditions where porosity is a problem.

Revothane is silver-plated copper wire with an extruded coating of monochlorotrifluoroethylene. Even at 150° C (302° F) the insulation is inert... with no soluble liquids or plasticizers to run into contacts. Revothane withstands abrasion and flexing, and resists such corrosives as acids, alkalis and petroleum products.

Available in eight standard sizes from 28 to 10 gauge in 15 relief flexible shrouds, copper or silver braided shielding, heavy wall insulation and jacking can also be furnished. Multiple-conductor cables are also available.

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Humidity	95% up support embolism
Operating Voltage	1000 volts
Wires Allowed	9 AWG
Flare of Aids & Adhes	Continuously collected
Cold Heat (Compressive Strength)	30,000 PSI
Minimum Resistance (at 1.5-2.0M)	2000 psi 400 psi aluminum

\* Based on responses by participating stakeholders.

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44. See (a) *In re* [unpublished], 279 F.3d 1011, 1013 (9th Cir. 2002); (b) *id.*

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### Laboratory Equipment

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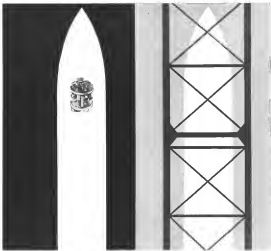
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• **3300** impulse generator, Model G-118, produces pulses that within 100 ns reach level of 980 to 1,800 nA, or up to 40,000 nA in a special model. Minimum peak power output is 9,000 mW/cm<sup>2</sup> per sq. cm of bandwidth. Output is continuously adjustable over a 70 db range. Pulse width is 0.0005 to 0.000005 sec, and repetition rate is continuously adjustable from 75 to 2,500 cycles per second. Catalog G-596 gives further details. Empire Devices Prod. Corp., 3015 Bell Blvd., Bayside 65, N.Y.



## Datamation On Wheels

A mobile data collection inventory-on-wheels, built by Brown Lohmeyer Corp., Los Angeles, for USAF's Wright Air Development Center, houses 18 data processing machines and a complete film processing laboratory.



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- ☐ ④ Closed Valve Is Different Condition
- ☐ ⑤ Auxiliary Power Supplies



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## Lockheed Scientists— a new type of bird-man

Pioneer bird-men ruled their flocks to prove that man could fly. Today's bird-men are the scientists who design their flock to overcome the odds of missiles (distances now "birds" which challenge the imagination) and to the development of the complex missile systems, so important to our defense efforts. Their work is arduous, intricate and essential to some of military importance—because America's superiority in aerial weapons faces a mounting challenge.

Lockheed is helping the U.S. armed forces meet that challenge by the rapid expansion of its Missile Systems Division. At Van Nuys, California, a staff

of over 3,000 workers is already deeply engaged in top-secret projects for the Air Force. Two new missile research laboratories buildings are being constructed by Lockheed on a 22-acre site in Stanford University's industrial park near Palo Alto, California. And, nearby, on a 275-acre site in Sunnyvale, Lockheed is building extensive engineering and manufacturing facilities.

Everyone at Lockheed's Missile Systems Division is working with a sense of deep urgency to help the nation retain its superiority in missile systems technology—and thus deter attack from any potential aggressor.



A VITAL PHASE of Lockheed's missile systems research and development is the testing of various and sophisticated safety avoid operating conditions. This Lockheed scientist (above) verifies instrument also transmitted from test missiles.

(AT LEFT) DR. LORNE W. HARRISON, first Chief Scientist of the U.S. Air Force (1950-51), now Research Director of Lockheed Missile Systems Division, (above) with a test system and a nuclear warhead. Numerous specialized branches of a high degree of complexity, including Lockheed's advanced research programs include: computer testing on high speed nuclear chemical propulsion systems, power applications of nuclear energy, physical studies of cryogenics related to rocketing, and rapid studies of implications of alternative propellants, are principal in the missile performance field, and others.

(ABOVE) A DEMONSTRATION MODEL used to illustrate the fundamental of the guidance system. Many advanced systems are now being developed in the field of guidance control and this model, built by Lockheed's Missile Systems Division.



ABOVE: SCIENTIST OF the Lockheed Division using gold foil test chamber to detect data on flow rate of liquid fuels at the various temperatures which might be encountered by a supersonic, high altitude missile in flight.



ABOVE: The speed-up simulation program now being used at Palo Alto will permit use of Lockheed's computer in designing the story of the full mission for Lockheed's missiles.

\*Lockheed's Advanced Study Program helps researchers evaluate the feasibility, achieve M2 design to Mission, vs. Electrical and Mechanical Engineering, Aerodynamics and other Physical Sciences. These Lockheed Missile Systems Division, Van Nuys, California.



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Van Nuys, Palo Alto, Sunnyvale, Calif.

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TEST RUN of a Duct combustor (between heavy flanges) under way at Texaco laboratory. Nine quartz observation windows in combustor.

## Kerosene, JP-4 Compete in Laboratory

By George L. Christian

Beacon, N. Y.—A competitive test program between aviation kerosene and JP-4 got under way at the Texaco Company's 101 Facility Laboratory, here, indicating that no significant performance differences between the two fuels. This is only a preliminary conclusion since

the tests are far from complete. "The evaluation is being conducted in cooperation with a commercial airline."

That JP-4 has its profound drawbacks alongside kerosene is significant from a petroleum supplier's point of view, a Texaco Laboratory engineer told Aviation Week.



ATC FUELS LABORATORY building includes a 3,000,000 Btu/hr. air heater (lower left), oxygen tank (center) and 1,000-kg. air compressor (area through open end of building).

"We can make" he said "a lot more JP-4 than aviation kerosene out of a barrel of crude oil. Our refineries are geared to produce large quantities of high distillate—gasoline and JP-4 type fuels. Concentration on JP-4 as a primary product would throw our refineries a lot less out of balance than it did, had to concentrate on a middle distillate, kerosene, for example, is a primary product."

### Gasoline Fete

If kerosene were to become a primary product and gasoline consumption were to decrease as long-range, commercial aircraft, dropping of large quantities of gasoline would pose a major problem. This situation might encourage oil players and thus cost switch to kerosene burning engines. Furthermore, gasoline prices might become de-

### Billion Gallon Demand

Commercial airlines alone will require 1.1 billion gallons of turbine fuel a year by 1965, estimates Dr. Wayne E. Reber, General Manager of Texaco's research and technical department.

pressed considerably below that of kerosene.

Current JP-4 and kerosene prices are competitive, Texaco says, though prices vary with local supply conditions.

To the question, JP-4 has the advantages of:

- **Compatibility with engine design.** All gas turbine engines built in the country have been designed to use JP-4.
- **Lower burning point.** This has been a —74° for JP-4 compared to about —40° for kerosene. (Freezing point of kerosene can be lowered considerably below —10° by using specially selected crudes, but this restricts quantities and at the same time raises prices.)
- **Less danger of high altitudes.** JP-4 being more volatile than kerosene. Fuel/air ratio in tanks usually is too high to be ignitable under the low atmospheric pressure of high altitudes.

Kerosene has its advantages. For comparison rate a lower flash JP-4 also, because U.S. fuel laws are based on combustors, not on the kerosene is not subject to the 2 cents a gallon applicable to gasoline and JP-4 is better acquainted by the aircraft.

### Complicating Trend

The increasing trend among gas turbine designers towards higher compression ratios is complicating the life of Texaco technicians. (Provisionally the ratio of pressure at the compressor outlet and inlet.) It is a hole pocket of altitude and varies only with compressor rotational speed and design.

The greatly increased air flow is evident in engine compressors, especially with two speed designs which have boosted pressure ratios from the usual values of 4 to 7.5 to 10.1, demand such high power as to require, the air that the requirements in power and equipment are becoming prohibitive.

Carriers of high pressure ratios are increasing compression pressures which have jumped from 350 to 400, 500 to 600, and combustion inlet temperatures which have soared from 400 to 500°F to 550°F and over.

### Deposits are Bane

Research engineers at the laboratories are working on two vexatious problems, deposits and oxidation.

- **Deposits.** When jet engines first were designed, combustion chamber deposits were on each surface of turbine. Frequent air wash was used, but higher combustion chamber temperatures and more complex wall shapes have brought these back on stage.

Blowing off combustors; chamber walls and vane turbine blades. These

deposits are often severe damage (to, undoubtedly, restrict the flow of combustion chamber walls per se, but have been ground up in the turbine and exhausted without damage).

- **Oxidation.** The existing temperature, pressure and jet engine conditions, ranging to 3,500-4,000°F, have made it important to keep heat exchangers from the burning fuel to a minimum.

Texaco scientists say, that some of the most serious damage to the heat exchangers is the oxidation of the heat exchanger surfaces. The lower the oxidation, the better the oxidation.

Our problem," Texaco Laboratory technicians say, "is to transfer all the chemical energy possible from the fuel to the air stream in a jet engine's combustion with a minimum of oxidation on the combustion surface. We want to heat the fuel without its having a glowing effect. This is just the reverse that occurs in a typical house burning furnace."

### Major Decision

A major decision, taken by Texaco officials while planning the original laboratory in 1947, was to install facilities for equipment—large test compressors, burner pumps, burner and combustors to test jet engine burners. Thus Texaco technicians were not forced to use small-scale, bench type burners to test fuels, which complicated the comparison and verification of the results of all of the testing. Various small scale test rigs to full scale gas turbine engines.

As a result, Texaco researchers ex-

### Equal Heat

Comparative test methods of JP-4 and aviation kerosene, cut:

- **JP-4.** 13,064 Btu/lb.
  - **Aviation kerosene.** 13,062 Btu/lb.
- The comparison with 13,070 Btu/lb. for aviation kerosene with certain ratings at 10, 90 and 100 and 13,900 Btu/lb. for JP-4 with 13,144 aviation rating.

actly can simulate the problem of jet engine maintenance. The kerosene JP-4 tests, for example, are being conducted with a combustion burner a Multi-Rotor Duct engine—the Volcan V-twin turboprop.

### Laboratory Equipment

Equipment Texaco has installed to simulate the high pressures, altitudes and temperatures associated with high speed jet flight includes:

- **Air compressor** with a total capacity of 3,500 hp. Largest is a 1,000 hp. screwdriver Compressor unit which can be modified, piped for one, two or three-stage operation.
- **Air heater** built by gas, which can generate up to 3,000,000 Btu/hr. preheats air pumped to the test stand to a minimum of 500°F.
- **Fuel pump** which delivers fuel to the test stand with pressures up to 1,000 psi.
- **Shut-down** to quiet the noise made by equipment being tested and in the lab machines.

Texaco started working on jet engine fuel evaluation in 1945 in cooperation



### Portable Aircraft Preheat Units

These preheat units are part of an order being built by Shell Aircraft, Inc. For preheating the engines, battery compartments and nacelles of jets and transport aircraft. Each unit is rated at 150,000 Btu/hr. and are powered by a 1.5 hp. Kohler 6/90 engine. Manufactured by Los Angeles Engineering Co., Long Beach, Calif.



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with General Electric's turbojet development at G. E.'s Lima plant.

Among jet engine operating problems which Texaco's laboratory technicians investigated were blow-out combustion efficiency, deposits and correct fuel gas heat.

### Start in 1947

Planning for the first jet-fuel lab was started in 1947 and it was opened in 1948.

In the period 1949 to 1953, much work was done in evaluating fuels on different types of combustion. Generally, findings were that combustion problems resulted on the water design rather than on the type of fuel used.

Tests were determined that water on turbine would operate, accordingly, no amount any kind of fuel but others were very sensitive to the type they burned.

The old laboratory was shut down late in 1953 and through most of 1954 as the transition was made to the new facility.

Today, Texaco is putting the finishing touches on this new, full-scale jet-fuel test laboratory in which the program of evaluating is under way.

Texaco claims as part of the company's principal research work at business, is the nation's largest privately owned and financed jet-fuel laboratory.

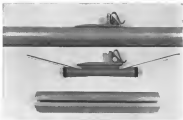
## Piston Actuator Launches Stores

Manhattan Beach, Calif.—A free-piston pneumatic actuator which offers twice the stroke of an equivalent-length conventional cylinder-piston combination is being used for launching stores from limited space in sub-satellite warfare research.

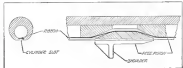
Produced by Pluriflow Turbine & Airplane Corp.'s Studies Division at its western branch in Manhattan Beach, Calif., the free-piston actuator is used

for launching stores such as missiles, parachute flares, and air-to-air rockets. It also offers potential applications for such services as engine vibration system of thrust reversers, adaptive nozzle positioning, and door actuators.

The actuator consists of a dished cylinder and a free piston with a diaphragm protruding through the slot. The slot is sealed with a dual ribbon that is flexed through the piston and



ACTUATOR (top) is composed of free piston (center) and dished cylinder (bottom). Side section view (below) shows dual ribbon seals and slot in free-piston actuator.



### Periscope Monitors Refueling

New crew aboard North American AJ2 Stinger tanker planes on the Lifescope MCD80 loading monitor periscope to observe fighter planes coming in for an in-flight refueling. Forward section of the periscope helps meet the pilot's line of sight. Here a Chance Vought F4U is seen through the upper's eyepiece.

extending the length of the cylinder.

Since there is no connecting rod, a weight moving in a cylinder, and the free length of the actuator remains constant, only slightly exceeding the piston stroke. Thus, the free-piston combination offers use in confined areas where space available would not permit use of a conventional actuator with piston and extension beyond the cylinder.

In its present application for store launching, a battery of free-piston actuators is used on the Lockheed PTV, Martin PFM, Douglas C-74 modified for store release, and is also being incorporated in Canada's new CL-25.

In these applications, as pistons in the area behind the free piston forces the ribbon seal against the edges of the cylinder slot, permitting only slight leakage. At the same time the piston is flexed through the cylinder so that the piston's pistons should engage and clear the store. Pressure is held

just the ribbon seal to the atmosphere. System pressure is then applied to the opposite face of the piston to return it to load position.

As for the cycle it is supplied by a 2-psi, 3,000-psi compressor. Pressure in the actuator is regulated to 710 psi.

### New Barometric Control Measures 15-in. Changes

Los Angeles—A new barometric altitude control, accurate enough to record a change as small as 15 in. at ground level, has been developed by the Garrett Corp.'s Aerospace Mfg. Division, Los Angeles. At 60,000 ft. it reportedly can sense changes of 3-1/2 in.

The new instrument also features a rate of descent control. When approaching a runway, for landing, it will make the necessary corrections for proper descent rate quickly through the automatic pilot control.

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## Delta Backing Saves Packing Gland Wear

Northrop Aircraft, Inc., has developed a promising solution to hydraulic cylinder piston packing gland wear in hydraulic components with a light control valve solution.

Northrop uses a modified delta backing for the O ring instead of the conventional spiral backing and reports that the delta type seal, consequently, supports the ring relieving friction, minimizing distortion and wear. On extended tests it was a 50 percent improvement over the spiral design without leakage or need of readjusting, and the ring are still in use.

A modification under test over a previous seal used of the external O ring seal to absorb high pressure and friction loads (shown) would controlled amount of leakage which is retained by the O ring and returned to the system reservoir or the component. This arrangement is seen as providing greater packing gland life and reducing external oil leakage to a point not sufficient to maintain adequate lubrication for the hydraulic piston.

## Northrop Builds New Missile Shake Tester

A rugged electrohydraulic shaker tester used to simulate vibrations encountered in shock tests of the B-57B aircraft, Northrop Aircraft, Inc., has been developed by Northrop Aircraft, Inc.

Measuring less than one cubic foot in volume, the shaker can apply a force of 500s in electronic components weigh-



BUCK Supports Shaker (Above) Under Test

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ing more than 1,000 lb. It will test the effects of frequency vibrations ranging from 5 to 600 cps.

Northrop reports that the more powerful magnetic shakers available through seismic instrumentation in electronic components. The new device is only about one-half the size of the shaker used by other testing facilities for engine tests.

The shaker operates from a horizontal or vertical position. This permits it to exert vibration forces from more than one direction to obtain a maximum reaction from the test specimen.

Features of the test device is a two-stage electrohydraulic shock valve, built by Borton Products Co., Pasadena, Calif., to afford precision control of the hydraulic power. An electric transducer detecting reaction to the valve's pilot port, which controls the speed and amount of the piston rod to shake the specimen.

## Self-Propelled Powerplant Deliveries to Navy Start

Initial shipments of self-propelled electric powerplants for testing Navy aircraft are being made by Consolidated Diesel Electric Corporation, Woodland, Calif. The units, incorporate a heavy duty, 40 horsepower, 30 hp., 400 cycle or alternator, rectifier and inverter and control and output cables connected to a specially designed, all-wheel drive chassis. The units, capable of pulling the vehicle and power the electrical generating equipment.

## Oakland Firm to Overhaul More T-33s for Air Force

A contract to overhaul an undecoded additional number of T-33 jet trainers has been awarded Aerojet Engineering & Manufacturing Co. by the Air National Command, the Oakland, Calif., firm announced. The contract will require the immediate employment of 160 to 400 more employees covering most of the machine shop.

## GE Maintains 5,000 Deg., 2.7 Million psi. in Vessel

Pressures of 2.7 million psi and temperatures of 5,000 deg. F. have been maintained for long periods in a special pressure vessel built by General Electric for use in large hydraulic presses. It is expected that one of the primary vessel now used to reproduce techniques in producing man-made diamonds and other crystals.

Dr. Percy Bridgman, Nobel Prize winning physicist, said that it might even be possible to produce a superconducting high industrial quality superconductor from artificial diamonds.

AVIATION WEEK May 26 1956

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**CONICAL SHROUDED** jet features of P&W jet engine suppressor attached to J57.

## Pratt & Whitney Offers Portable Jet Noise Suppressor Design Free

East Hartford, Conn.—An exhaust noise suppressor design for jet engines ground running, a portable device, can be installed and removed, has been offered without charge to the industry and the military by Pratt & Whitney, Inc. An initial noise factor, which deals with the pressure waves of sound from the exhaust has been notified, has been built by Pratt & Whitney, though its design is not included in the offer. For their experiments an order was on noise noise.

None of the equipment has reliable application. Wright A. Tuller, P&W general manager and the suppressor would be helpful now at military bases and later at overseas air bases to reduce jet start flying. "Without one," he said, "would be an instantaneous and method of completed jet engines. Because engine noise has concentrated in soft off operations in order to sustain thrust output the suppressor has no application there."

### Not Whole Answer

And, Perkins said, the suppressor is not a complete answer to the noise problem.

"It's simply a breakthrough," he said, "it will permit reduction in noise level, in a more comfortable environment. It will also substantially reduce the noise in areas just behind the exhaust."

Obviously, the noise problem has always been clouded of scientific development. "We have made steady advances in controlling noise, but the creation of silencing devices without loss to fuel somewhat. First you must get the power before you silence it."

The suppressor prototype has been created in 1974 by John M. Tyler chairman of the P&W Noise Control Committee, and Edward C. Perry, Jr.,

of United Aircraft Research department.

The suppressor has allowed us to make burning airplanes in the particular field of sound control," Tyler said.

"We conducted a test recently before a non-technical group at the Boeing Airplane Co. plant in Seattle the suppressor attached to a J57 engine on a B-52. The engine was started and after doing a few minutes we measured the power to where it normally would be developing noise, then 10,000 to three."

"The spectrum was standing about 100 ft. away taking in conventional noise. It was run after one of them began as it when we were going to run up the engine that they lowered the test but have completed."

### When Award

The 1974 Pratt paper which discussed the overall jet noise problem, was the North Atlantic Treaty and the Wright Brothers Memorial from the Society of Automotive Engineers. Tyler described in early model of the suppressor a perforated sheet metal cylinder, in an SAE paper last year. This year in SAE paper by Tyler and Robert Knapoff described refinements of the suppressor, namely three conical



**HALF SCALE** model of noise reflector has hollowed reflector to modify noise.

shrouds wrapped around the exhaust, and the inlet shrouds.

The conical shrouds also added the SAE paper and to give the exhaust gas an approximately constant velocity after it has escaped through the perforated sheet metal. This is done to prevent turbulence or eddies along the wing or in airplanes with the engine ports below and ahead of the wing.

After the exhaust noise is suppressed, the inlet noise becomes the most objectionable, the paper said. To a microphone working near the inlet the pressure noise produced by the expansion of the compressor blades on the incoming stream of air can be much louder to hear than the integrated exhaust.

Butler then asked this noise. Tyler and Knapoff denied to affect it upward. They found the reflector is found the overall noise ahead of the engine 7 to 11 decibels at a cost of disturbing the surface to the engine inlet.

Since these sound levels were made, a half-scale model has been added at the entrance of hollowed models of the reflector and a configuration has been found in which average pressure losses are approximately equal to the pressure losses in the inlet. Further sound tests are planned to determine whether the noise reduction characteristics have been altered.

### Afterburning Engines

For afterburning engines Pratt & Whitney plans to use an afterburner for engines being run in the open. Such a device installed but not for noise reduction, the paper said. From their work on ground noise suppression, the authors concluded:

(1) Primary advantage of suppressor and reflector is that they can be carried to the engine and stopped in place, and the engine is not disturbed during running. They can be removed just as quickly and the engine is ready to be out and take off. It has been based on the J57 that the exhaust suppressor has no significant effect on supersonic exhaust as before certain pressure units. Tests have been run in the 6,000 to 10,000 lb thrust range.

(2) Even afterburning and exhaust has advanced the inlet of the engine, saving a great deal of money at high power without benefit of noise control.

(3) None of the J57 with the exhaust suppressor attached drops into the supersonic but ground level in a relatively short distance and further solutions in exhaust noise would not be in the field as growth reduced by the inlet.

Answering questions were on pressure waves and an exposed for ducting tends to noise, the authors said.

"While suppressor and reflector installed it is obvious that the risk of



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damage to the housing of mechanics who may need to work on the engine operating at high thrust has been greatly eliminated."

The suppressor is 6 ft. long, 2 ft. in diameter and weighs 150 lb. It has a single Mylar bag which permits easy attachment to the engine. The development work was done on the J-1, but the principles are applicable to any jet engine, J45/W-50.

It is not strictly a silencer, but a noise control device. "Turbulent flow is controlled so that the noise produced is of very high frequency it is not audible to the human ear."

Republic Aviation Corp. tested a ground noise suppressor for Jetstream. This muffler has a 30-in. pipe leading into a tank 10 ft. in diameter and 20 ft. long. The muffler must be backed up to the muffler. The muffler is portable so that it can be moved to various places as an aid.

### North American to Build Mach 2 Wind Tunnel

Another major step toward self-reliance has been taken by the Columbia division of North American Aviation in contracting for a new two-ton, cryogenic building addition and a wind tunnel with Mach 2 capacity.

Primary function of the division is development and production of Navy aircraft.

It is currently running on the F-4 Phantom in extensive redesign of the original wing plan. In addition a new "X" attack airplane, the ATF, is under development.

A jet trainer design, the T-21 has been entered in the current Navy competition.

The wind tunnel is planned to cover both subsonic (up to about 500 mph) and supersonic (up to Mach 2) speeds.

### Parachute Flares Used in Copter Night Landings

Helicopter night landing technique using parachute flares has been tested by Westland Aircraft Ltd., Yeovil, England using a Whittard 15-T1 before officials of British Air Registration Board at 1,800 ft. the pilot released a 75-sec. flare simultaneously cut the engine and flare auto-ignition at 100 ft. a 45-sec. flare was released.

### Large Contract Awarded For Portable Starters

USU production contract of 50-125-574 covering MA-1A portable starters for large jet aircraft has been awarded Continental Aviation & Engineering Corp., Detroit, Mich.

## NEW AVIATION PRODUCTS

### Small Fan For Nozzle

Aviation Jet cooling fan for nozzles weighs 11 ounces and measures 2 in. in diameter by 1.5 in. long. It weighs 58 oz. ft./year at five dollars and 55 oz. ft./year at two inches static pressure.

Used more at 20,000 rpm and in



vented for 400 cfm only, either 280 in. three phase or 115 volt single phase. It has an input of 35 watts. Solid jet nozzle assemblies allow the fan to be enclosed in an airtight shroud giving an air flow.

Kellogg Manufacturing Co., Schenectady, N. Y.

### Vacuum Pump Reduces Pressure

Electronic water diodes collected vacuum pump Model RG-1979 is designed to reduce air pressure as required for satisfactory operation of electronic pressure measurement tubes. This unit can be operated in an open or closed air can be generated to 15 psi.

Range of operation covers one level to



10,000 ft., using ultra-high temperature range is -31F to +110F. Capacity is 1,500 cc. in./min. maximum flow at 100 psi.

A noise noise filter is included. Last known Division, Last, Inc., Elms, Ohio.

### Mobile Crane for Planes

A heavy duty mobile crane, designed to permit one-man rapid changes of ac-

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The Type 1501 Special Purpose Receiver is now being offered as the improved version of the NEMS-CLARKE 147-11 and 147-12. The only 1501 receiver incorporates the best features of both of the former types plus many new features including a BFO. A wide bandwidth control is provided to greatly improve signal-to-noise ratio when full bandwidth is not needed.

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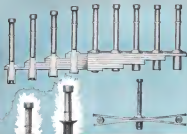
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Excellent hole filling characteristic of Cherry "700" rivets are shown in cross section photo above. That photo also demonstrates that various standard fasteners can be riveted successfully with rivets of identical length. Lower illustration shows high clutch obtained with "700" rivets.

## Versatile Cherry "700" Rivet Provides New Uniform Fastening Method

The hole filling qualities, wide grip range, high clutch, and positive stress retention now possible with the new Cherry "700" rivet give the aircraft industry a new family of fasteners never before available.

In the past, variations in hole diameter made it virtually impossible to completely fill the hole in every instance. This difficulty is eliminated with the "700" rivet which allows adjustment to fill the hole and provides high stress retention.

The method of setting the "700" rivet also provides high clutch and makes it possible to use one length to fasten a wide range of structural thicknesses. Positive insertion is easy since a properly set rivet is indicated by the current of stress shoulder protruding above the rivet head.

The "700" rivet is available in

countersunk and universal head styles in a wide range of diameters and lengths. It is installed with standard Cherry rivet guns with controlled-stroke pulling heads and accessories.

A product of the Cherry Research and Development Department, the "700" rivet has been the result of 4 years of fastening experience in the aircraft industry. This organization has developed the widest range of types and sizes available in the industry. Cherry engineers have designed and built special purpose machines and developed techniques that make possible such innovations as the "700" rivet.

For technical data on how the Cherry "700" rivet will give you a more uniform method of fastening, write to Townsend Company, Cherry Rivet Division, P. O. Box 2107-N, Santa Ana, California.

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craft engines or other heavy components has been developed for the Air Force. It can be used at 70 mph. Cross weight 1,000 lb and has a rated capacity of 5,000 lb. Hook clearance is 2 1/2 in. Subco Steel Products, Inc., 6234 W. State St., Milwaukee WI, Wis.

## ALSO ON THE MARKET

Engine and flight hour meters, designed for direct reading, are true time measuring instruments, not a revolution counter. Engine hour meter records actual operating time of aircraft on ground. Flight hour meter indicates number of hours aircraft is actually airborne. Hens Associates, Inc., (Telephone N 1).

Electronic universal testing machine now available equipped with an XY oscilloscope recorder which can be used in place of, or in conjunction with, standard dial indicator. Used not only on plate load applied, but also load vs. column (tension) or load vs. time. —Trans Ocean Testing Machine Co., 5757 Keston Rd., Willow Grove, Pa.

Packaging gage has been developed for measuring how much a bolt stretches when tightened in an assembly. It has self compensating variations in bolt length. Low-temperature machine also allows testing gage and gaging tool so that part can be involved in test bolt without being used—Standard Production Instruments Division Steel Field Corp., Dayton 1, Ohio.

Face gage for 50,000 lb tests is available for other compressive or tensile tests and has a warranted accuracy of within one percent of indicated reading. Dimensions of compressive model: 15 in. high, 34 in. thick (including dial

indicator), 8 in. wide, 30 lb. net weight. Dimensions of tensile model: 16 in. high, 7 1/2 in. thick (including dial indicator), 30 in. wide, 17 lb. net weight. —W. C. Dillon & Co., Van Nuys, Calif.

Molded rubber blankets or bags of vinylite are contour have been developed for use as vacuum molding of an reinforced plastic laminates. Bags will withstand temperatures up to 240-260°F and a hot can be replaced by a cold one at cost of a cold patch—Quaker Rubber Division, 311 E. Fresno Canyon, Los Angeles 10, Calif. —Tosco & Condit St., Philadelphia 24, Pa.

Aircraft beddown kit contains three struts, two 18 in. and one 6 in. long, 1/8 in. bar in tension, series—Aerojet Propulsion Co., Azusa, Calif.

Head rest setting gun is designed for operation with standard 1/2 in. electric pressure drill. It will set all lengths and direction of dimensions, standard Cherry rivets and Townsend universal rivets. Weight (without drill motor) 3 1/2 lb. length (including pulling head but without drill motor) 1 1/2 in.—Cherry Rivet Division, Townsend Co., Santa Ana, Calif.

Ultrasonic degreaser for cleaning parts for bonding is available. Used in Helibonding, grip and air conditioning work, John Helibonding Co. cleaning stages are bonded vapor degreasing and ultrasonic solvent cleaning, in order desired. Ultrasonic power up to 500 w. at 40 kc. frequency is available out of area of 7000 A.—Industrial and Scientific Products Division, Curtiss-Wright Corp., Caldwell, N. J.

Leftover adhesives, based on new epoxy resins, are designed for general and special purpose bonding of rigid materials such as metals, glass and plastic. They meet the waste requirements of MIL-A-9000B for aircraft structural assemblies. —Lafayette Chemical Co., Perry Station, White, Calif.

Degreasing basket holds heavy extruding parts such as aircraft frames, shafts, and other long sections for cleaning. Unit combines air system, a buffer and frame (both basket and extruder in frame). It holds a maximum number of parts in a minimum of space, with largest possible surface area of each part exposed. Frame is 18 in. x 36 in. x 15 in. basket is 10 1/2 in. x 16 in. x 10 1/2 in.—Waters Manufacturing Co., 40 Miron St., Bridgeport, Conn.

Sealed epoxy structural precast assembly kit now five times as many



## Another Development of Cherry Research Gives You Greater Fastening Efficiency

Newest in a long line of Cherry developments the rivet gun shown above which will set any type or size Cherry rivet. The G-80 gun is powered by either a standard electric or air driven drill.

The versatility, positive action, ease of handling and maintenance-free service you get with this new G-80 gun will bring increased efficiency to your production lines—reduce equipment inventory—help cut unit costs.

This Cherry gun was designed and developed by the research department of the Cherry Rivet Division at Santa Ana, California, where it is also manufactured. In fact, all the tools for installing Cherry rivets are developed and produced in that plant. They are used to install a major portion of the blind rivets in use today by all industries.

In addition to developing maintenance tools, the Cherry research department is experimenting constantly with new designs and materials for strength fasteners in order to meet the greater stresses and higher temperatures imposed by ever-increasing aircraft speeds and loads.

This research recently resulted in the introduction to the aircraft industry of the new Cherry "700" rivet which has characteristics far superior to any blind rivet made previously. It provides a wide grip range, positive hole fill, high clutch, uniform stress retention and permits 100% positive inspection.

For information on Cherry rivets and the tools for installing them, write Townsend Company, Cherry Rivet Division, P.O. Box 2107-N, Santa Ana, California.

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Whatever your remote instrumentation requirements, let RREP's systems engineers design today's telemetry...from design to implementation, aerial and ground follow-through, complete solution and on request.



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Designed for remote sensing, 2.5 to 4.5 watts per 50 ohm load. Frequency range 2.5 to 100 MHz. 100% duty cycle. 100% efficiency. 100% reliability.



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MOVING OUT OF GROUND EFFECT, sliding, forward and rearward flights have been made by Convair's Model A.

## Convertawings Start Helicopter Tests

A direct mechanical control system for a future multi-engine large transport helicopter is being developed by Convair, Inc., Aurora, N. Y. The firm is using the system on the Model A, which is powered by two 950hp Continental engines. Convertawings president Dave Kaplan (photo, right) reaches for the safety belt prior to a flight test. V-belt connections from forward engine to transmission shaft (below left) is duplicated at rear of the shaft. At each end are two chains providing 1:2 reduction to the shafts connected to the four rotor blades and 18-20 diameter blades are detailed at bottom right.



**RAYMOND ROSEN ENGINEERING PRODUCTS, INC.**

32nd and Walnut Streets, Philadelphia 4, Pa.

Western Regional Sales Office, 12106 Ventura Blvd., Sherman Oaks, Los Angeles, California



## Cessna's New Dealer Promotion a Success

By Elena J. Bullman

Cessna Aircraft Co., touting up the results of a new sales performance technique, in the aircraft industry, finds the result, surprising.

Previously, Chinese like most of the rest of the audience, had introduced us to business and pleasure appliances in design and technique in a showing once and done at the Victoria Kai, plant. There were several drawbacks to this system, among them the hand and separate method for the studies from others and the loss of information in further processing in setting up and programming the exhibit. Most important of all, the general public was excluded.

So this year Crossin decided to take a leaf out of the promotion book of the automobile industry. The company exhibited its sales results the same, in automobile companies' showrooms, monthly through their dealers at local shows. Beginning in mid-March and lasting through mid-April, sales figures from the factory took form of 1994 demonstrators, comprising a complete line of business vehicles, around to distributors throughout the U.S. and Canada.

- Over \$1,475,000 worth of replacement orders shipped.
- A total of 71 business records sold: 34 Model 182s, 5 Model 180s, 16 Model 372s, 2 Model 170s and 11 two-copier Model 510s.
- Between 35,000 and 40,000 records.

estimated upward to the computer's  
display. That for 50

International Western Industries, Inc., a Class 1 distributor at Wichita, Kan., says it has patented sales contracts on over 52.4 million worth of airplanes, with some orders already signed and planes delivered. The planes were sold during the show.

Intimidated was hit by bad weather during its public presentation. Nevertheless, over 90 people showed up. The distributor's success on a commercial publicists basis, their talent group, a featured spot on the television news program of NBC's John Conner, Secor Jr.

**Foot Sales**

A spot check around the country provided these accounts of customer reactions:

• At Ft. Worth, Tex., a dealer sold five appliances during his show: one to a man who had walked in out of curiosity, without the Crown money, and had a demonstration talk to a 162 lb. brought in a replacement on the spot, trading in his older one.

• In Portland, Ore., a businessman who had not flown for five years, because of domestic-flight safety, is the 182 and 110 lb. decreased the probability of having a 182 but when he returned the next day he picked the 184 and wrote a check for \$67,000. He took immediate delivery on an airplane.

the dog's eye and her nose, with  
the dog's cheek and

• In San Angelo, Tex., the doctor, after the loss of showing of the Model 192, the owner of a new 1-2 worked on his engine while practicing cross-country landing without incident. The General doctor called the man that evening. The man decided he needed an airplane in his business, adding that he had worked for the previous year and had explored those who were involved in a new airplane. He brought

• In Wichita, Kan., four airplanes were sold. Three feet courses in seductions on the 172 were included in the show prices, which included color photos, tie, chips, card links and sets of highball gloves.

At Lumbok, Tex., a black and gold theme set off the show. All planes were painted black and gold or gold with black trim. Black-and-gold streamers hung over the display area and the dealer wore a black suit with gold accessories.

In Seattle, Wash., and Little Rock, Ark., dealers displayed a carnival theme many circus tents for their doggie. The Seattle man brought in three carloads of novel novelties in gear the best of western's atmosphere.

Many prospective buyers brought their wives to the show. Spatial 1.2 minute binary color and sound movie introducing the 152 and showing a 310 demonstration helped sell the wares on the mezzanine and main floor.



CONTINENTAL ENGINE for 192  
W. H. H. H. H.

business travel, some golfers reported  
 5000 below the show went on the

rent, the Cinema dealers had five out-of-date folders from the factory, packing the current presentation. There were 85 pages of double-spaced text revealing how to Plan It, How to Execute It, How to Publicize It and How to Advance It. Check lists were provided so that the dealer could keep a running record of how the plan was being followed and whether the schedule was being maintained. There was even a "business card" layout for a 25-man theatre to house the movie dealer.

Facture officials told Americans War, they had a good source for being on the master plan. They obtained the order show book and promotion package and by a large U. S. automobile since facture and modified it to fit this purpose.

### Therapy-Day Schedule

The three-day schedule was broken down this way:

\* Dealers, operators and salesman of the distributor were visited the first day. The distributor was encouraged to leave in the area for a further

• **Customer:** retail prospects and the public were invited for the second straight day. Bringing the show to the public was part of the Coors concept of people merchandising its own beer on a nationwide basis. The company feels that though many of these people will never buy an impulse, purchasing the job business living it, doing it still speaks to the development of the industry. Dierich provided free coffee and donuts to those entering the

Hundreds of people seriously injured about buying a new set of used apparel and what was involved in ignoring fire to fly and more, dealers reported a quick, growing in flight intention, less than after their shoes.

## U. S. BUSINESS &amp; UTILITY AIRCRAFT SHIPMENTS

January–April 1998

	Aircraft		Rubber-Matting Price	
	April	Jan. 1964 Total	April	Jan. 1964 Total
Avco Design 560-A 560	3	10	\$890,000	\$1,790,700
Beech Bonanza Super 18 D165	46	120		
Super 18 D165	10	21	3,043,175	4,768,958
Travel-Fan Model 45 trainer	5	5		
	12	51		
	3	0		
Cessna A-4	1	5	5,118	18,009
Cessna 440 Super-Midwest	8	7	56,423	259,000
Cessna 179	11	39		
172	180	559		
180	39	343		
182	167	38	3,713,218	9,713,921.64
182P	5	0		
310	80	64		
315P	1	1		
Champion TEC	17	38	58,077.84	168,700
Heller 301-B Courier	9	7	46,000	168,000
Lox Locomobile 1	1	2	400,000	800,000
Monomay Model 18C Model 20	3	3		
	2	13	30,853.60	140,960.80
Piper Super Cub PA-18 Super Cub PA-18A Super Cub PA-18A Super Cub PA-18	68	87		
	54	175		
	130	21	1,946,259.39	5,681,338.46
	36	105		
Royal Gull P-126L	1	0	74,900	647,000
Travel-Fan Model 20	3	8	81,000	31,553.40
Total	661	1,847	\$10,556,818.40	\$89,000,330.80

<sup>c</sup> Apical and median of L10.

Source: Compiled by AVIATION WEEK from manufacturer's reports. Figures for 1924: A/W May 7, p. 101; April 2, p. 67; Mar. 19, p. 67.

### Peak Plane Deliveries In April

**Revolving payments of \$63 million and utility taxes totaling \$10 million were due in April, 1994, at \$30,375,120 per month by U.S. manufacturers in April. It ran the highest month in number of aircraft and dollar volume this year and exceeded all months' last year by wide margins. The airline's loss in April total was 7,110 planes (valued at \$39,552,751) (see chart).**

Manitowoc delivered 511 units, compared to 401 in March and 406 in April. Its 300 airplanes shipped with billing order of \$3,713,439 brought its four-month total to 1,254 planes (about \$13,427,416). In numbers of planes, the four-month total coincided that of Aero Design & Engineering, Beech and Piper combined, leaders of their total dollar volume, too: \$20,339,790.

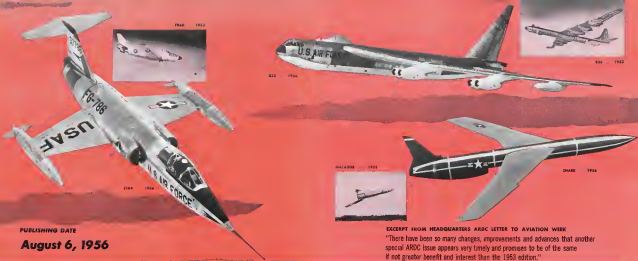
## Exports Up 62%

Export shipments of business and services, planes climbed 57% in April over the average monthly rate last year, with five manufacturers delivering 30



**KANSAS FAMILY** wants the Crown 102 at public display in Wichita, but (right) shows how the rest of the country took to show





PUBLISHING DATE

**August 6, 1956**

## THE ONE AIR RESEARCH and

## DEVELOPMENT COMMAND EDITION

### TIMED TO FEATURE



**AIR RESEARCH AND DEVELOPMENT PROGRAM** as determined by the 1957 fiscal Airpower Budget now in debate and to become effective **July 1, 1956**.



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**ON-THE-SPOT REPORTING** at all the 12 research and development testing centers of AIR RESEARCH AND DEVELOPMENT COMMAND of the United States Air Force by AVIATION WEEK's technical editors — the largest technical staff in Aviation publishing.

ONLY ONE ARDC EDITION in 1956 will satisfy aviation's "need to know", with a presentation of the ARDC story.

... over **80,000\*** Engineering management men will read and refer to this vital edition and several thousand copies will be made available for special service units.

Your advertising message placed in the ARDC issue will reach Aviation's most influential audience.

\* AVIATION WEEK average net paid ABC circulation June 1955, 170,343. Full circulation of current issues, \$8,000. Based on the research by Advertising Research Foundation shows 1.4 read-on by every subscriber copy of AVIATION WEEK (breakdown determined by personal interview using direct recognition test). Current paid order \$4,200 copies.

### EXCERPT FROM HEADQUARTERS ARDC LETTER TO AVIATION WEEK

"There have been so many changes, improvements and advances that another special ARDC issue appears very timely and promises to be of the same if not greater benefit and interest than the 1953 edition."

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## AVIATION WEEK

A McGRAW-HILL PUBLICATION





# New simplified approach to temperature control has superior reliability

## Edison Reverses Trend Toward Complexity in Aircraft Accessory Systems

Proven in service on the Douglas C-124 Globemaster, the Canadair de Havilland D-603 and many other operational aircraft, the Edison simplified temperature control now reverses the trend toward complexity in aircraft accessory systems.

Compact and lightweight, this highly reliable temperature control uses only standard electro-mechanical components—no electronic equipment. Its design completely eliminates costly maintenance training. The instrument's checkout procedure is familiar to any electrician.

This basic control teams up with the rugged Edison Five-Digitator Cable or with any of Edison's new Remote Resistance Temperature Detectors to warn of fire in engines and baggage areas or to signal dangerous temperature rises in bearings, heating ducts or oil lines. Detachments or alternate temperature indicators is optional on all in-cabin detecting systems using RTDs.

Edison field engineers with years of aircraft experience are located in Ft. Worth, Dayton, Glendale, Chicago and West Orange. They will gladly analyze your temperature control problems and recommend action. Just write any of these offices and let us know your requirements.

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worth valued at \$658,896 to 22 foreign countries. Average aircraft reports last year were 35 replace that were worth \$624,463.

The April deliveries alone brought the total through April to 331 valued at \$1,251,287.

Reporting reports in April were Aero Design & Engineering, Scott County, Texas and Talsworth Shipments, Inc., Houston, Texas in parallel.

see Algeria (1), Argentina (1), Australia (1), Brazil (2), Cambodia (2), Canada (12), Chile (3), Colombia (10), El Salvador (2), Ecuador Equipment Africa (1), Guatemala (1), Indonesia (7), Iran (3), Mexico (7), New Zealand (1), Nicaragua (1), Norway (1), Sweden (1), Switzerland (1), Union of South Africa (7), Venezuela (4) and Yemen (1). In addition, there were four aircraft delivered to African countries.



## Lodestar Cruises at 260 Mph.

An electronic modification of the Lockheed Lodestar is a business transport being flight tested by Minnesota Aircraft, Inc. It is designed to cruise at 260 mph on 1500 power at 7,000 ft and over.

The modification has a fuel tank, arranged providing 354 gal., enough for 1.30 hr. The Super-Duty can consume of 161.700 lb. The 1500-hp engine has been approximately 185 gal./hr. at 6000 power the modification has first reports.

As soon as flight tests are completed, Minnesota Aircraft will send the fully equipped prototype with linked interior around the country on a demonstration tour. Marketing plans include a price of \$279,000 complete, with interior to the customer's specifications and including radio and navigation gear. The customer is offered a standard equipment list of 3000. Collins is already available. Radio will cost about \$23,000 extra, including installation. The second Super Lodestar probably will be fitted with Collins radio.

One year installation guarantee is included. Airframe preservation, wing and engine.

**Feature Modifications:**

Following a complete overhaul of the base Lodestar and as an error found to C-4 and instrument alterations from specifications for an 8,000 ft. clock, Minnesota kept all feature changes.

not parallel to the line of flight with Minnesota Aircraft & Manufacturing Co. modification and to maintain the performance and drag. The modification was followed on the wings and tail. The former fuselage-to-distributor bearing saddle is removed and a new one of aluminum extends farther forward, carrying drag and providing an area for a fuel antenna. A new fuel tank boom is installed 9 in. lower and flush with the cockpit floor. The revised low pressure fuel tank ahead of the spar is a direct pressure fuel tank in the cockpit. A fuel tank having pleated doors is located at Station 185 at the rear spar, to separate the fuel from the cockpit. All fuel windows are covered double thickness to reduce noise level.

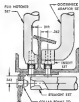
The cockpit has a super-sized fuel panel glass windshield 175 sq. in. larger is more than the standard Lodestar can operate.

Redesigned control pedestal allows more foot room for entry and greater accessibility to the controls.

Control includes autopilot control head with approach receiver and altitude controller, visual autopilot from indicator, indicator or and of roller door control switches and position indicator electric popper control and switches, speedbrake control indicator and indicator lights, throttle, weather, landing gear, and wing flap controls.

## HERE'S A TOUGH PROBLEM OF ACCESSIBILITY

for some fasteners but easily linked with HI-SHEAR!



Below: HI-SHEAR fastener used for 1/2" diameter HI-SHEAR.

Because of its minimum protrusion, weight and tool clearance, the HI-SHEAR rivet is installed into critical areas not accessible to other high strength fasteners.

Inexpensive HI-SHEAR Sets are available in a variety of shapes and sizes.

HI-SHEAR tools are used in standard rivet gun and sequencer — eliminating special single purpose driving equipment.



Write for the Tool Catalog for tool dimensions.

210 and 210-1/2 inch. 210-1/2 inch. 210-1/2 inch.











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*16 leading airlines will offer jet service  
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American-made jet airplanes flying for 16 U. S. and foreign lines will be in service over five continents starting in 1963. More than 100 Boeing 707s and Douglas DC-8s have been ordered to date—and still more orders are in prospect.

Turbojet engines designed, developed, and produced by Pratt & Whitney Aircraft will power both the Douglas DC-8s and the Boeing 707s. These are the JT3, commercial version of the powerful J-57, or the even more advanced JT4. Both are of twin-spool, axial flow design which provides high thrust coupled with outstanding fuel economy.

The new Douglas and Boeing jet transports will give the United States undisputed leadership in jet air travel. No aircraft in slight challenges them for speed, passenger capacity, and range.

Throughout the history of aviation, Pratt & Whitney Aircraft engines have led the field. Now the



PRATT & WHITNEY AIRCRAFT JT3 ENGINE, dual-spool turbojet version of the widely-used military J-57, most powerful jet engine now in quantity production.

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The SeaMaster crouches like a sprinter ready to spring. Then, powered by four J 71 jets, she rushes forward and slices off the waves.

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new section using nitrogen action. Minnesota American reports that it is doubling its present production rate at World Chemicals Park, Minneapolis, to handle the conversion project in addition to other production in cases.

The additional section will be housed in a new hangar adjacent to the present 35,000-sq. ft. facility.

### National Sells Lodestars, Substitutes Convaer 340's

National Airlines is gradually replacing its fleet of 11 Lockheed Lodestars with Convaer 340s on routes previously served by the Lodestars. The airline had converted some of the Lodestars into executive transports and was chartering them to corporations. Conversion of the remaining planes to executive configuration will be made before disposal.

Three of the Lodestars are being offered by William C. Wolf Associates, New York, and to engine aircraft broker

### PRIVATE LINES

Expanded "jet wing" links to Union Oil Co.'s Governor 340 business transport provide approximately 180 psi additional fuel, increasing its range by some 600 mi. All fuel is kept onboard of the engine nacelles. Modification was handled by Fuelco America Corp., and Aerotec Tank Service, Inc., Fairfax, Calif.

Extensively modified Governor L 13 is being built by League Aircraft Co., Torrance, Calif. Company has received Civil Aeronautics Administration certification on Jan. 23 of the Civil Air Regulations covering this model. It is possible that production may be limited in Mexico.

Chemical wood control material is available to aerial application from North Dakota Aeronautics Commission Extension Service. Fargo. Ask for Bulletin A-271.

A 140-lb. aerial photo survey will help in locating U. S. Route 60, Interstate Route 1, W. Va. The state road construction has recently assigned the project to Aero Service Corp., Philadelphia Pa.

World Civil capabilities will be used in Ontario, Canada, by Field Aviation Co., Ltd., Ontario. Discrepancy was caused by Vancouver Aviation, Ltd., Montreal, World Civil Canadian distributor.

Key to Aviation Weather Forecasts explains weather symbols on end of

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approximately 4-in. x 54-in. Quantities of up to 25 are available from U. S. Department of Commerce, Western Building, Washington 25, D. C.

Ohio's highway patrol department ordered a Cessna 182 for north-end rescue, aircraft, disaster aid, traffic control and search duties.

New order to safety publications is available from Civil Aeronautics Administration. Ask for Aviation Safety Release No. 484.

Transmisioned antennas for contractor student use in light aircraft has bottom gold for 100 hr. Practical course in this need. Trade named, "Plane Talk," the unit is made by Golda Co., Inc., 1544 W. Glendale Blvd., Glendale 1, Calif.

A Westland Whirlwind (S-55) helicopter is being delivered to King Seal Box Abidjan, Senegal, for use in pest control hunting traps. The helicopter will carry passengers aircraft will be maintained by Senegal Airlines.

Tulsa-Edgewater, Inc., Piper distributor is moving to a 210-acre airport near Elgin, Ill., from its area base near Elmhurst. School is being closed down the end of this year due to expansion of private dwelling construction. The distributor expects to spend \$100,000 in moving the new location.

New de Havilland Dornier four-engine turboprop transport is in the U. S. to explore sales market. It differs from earlier models in having full fuselage prop, also increased fuel capacity totaling 500 U. S. gal., refueled for 10 hr. mission. Fully equipped except for seats, it will be about \$178,000. Plans are being developed by DHI's U. S. representative, I. S. Smith, Marine Air Transport, Lakehurst Airport, N. Y.

Comet Westport primary trainer cancelled near Tucson, Ariz., after the Air Force pilot graduated during a year. Designed primarily to compete for Navy orders with the Beech 77 Jet Mustang and T-38, the Comets will 100 percent Westport (AW Apr. 3, 27) had been checked in 110 mph at 15,000 ft and dived at 470 mph. Comet Manufacturing Co., Tarrant, Calif., plans to build another prototype.

Leading off can be reduced greatly with proper use of flaps and elevators after touchdowns, National Aeronautics Committee for Aeronautics points out. You can reduce stopping distance on wet concrete 10% by raising elevators immediately after the touchdown touchdown. Immediate flap retraction provides up to 75% less roll on dry con-

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clude 25% of it's net. Flaps have little effect at this rate.

Aerowall's Arlington (Va.) branch moved to 5521 Secretary Rd., Suite 100, Chesapeake, Va. New phone: (814) 331-1116.

Map showing typical DMB coverage at 6000 ft. altitude and location of ground distance measuring equipment facilities in available geodetic form. Call and Aircraft Supply Corp., Detroit City Airport, Detroit 13, Mich.

Full-time support consultant in the field of Aircraft Design & Flight Test, Washington, D. C., is part of AOPA's unaffiliated program to increase small airport and landing area facilities. Airport member is Cyril C. Thompson, who has been working part-time for the organization since last August.

Major trend for corporate pilots will be Reading Aviation Service's 7th Annual maintenance and operations report, due June 1, in Reading (Pa.) Municipal Airport. Highlights will include procedures of 55,000 in daily groups and emphasis on outstanding business aircraft on the basis of appearance and equipment, and a study of new pilot rates. More than 1,000 pilots and groups attended last year's session.

American General Co., N. Y., is getting a Republic SA-1600 transport with the new 1425 kg. Wright GTCS601 (R1170-66) engines, recently selected for engine applications.

New Low distribution: Texas Air, Inc., Tuckersville, Ala., specializes and services of radio navigation and communications equipment, gyro instruments and navigators and flight control systems and accessories.

Fast production Saboteur, private airplane and certain indication of powerplant failure for multi-engine aircraft has been installed in Twin Otter aircraft transport of Champagne Paper & Fibre Co., Houston, Tex.

Aeromobile aircraft propeller on-terrain and manufacturing rights have been purchased from Koppert Co., Inc., in Universal Aircraft Industries, Denver, Colo. Universal states that it will produce the propeller soon.

Lockheed broke and cables and gears are expected to be cause of accident in Cessna 440 belonging to Capt. James Angel of David, Paizano. The well-known single pilot was hospitalized at Ganga Hospital in a neck of injury occurred when plane turned over during heavy engineless equipment maintenance.

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*Fort Wayne, Ind.  
"America's Happiest City"*

*Dear Bill:*

Now that Joe is on the team here at Farnsworth, he's asked me to write and give you the same story that got him interested in coming with us.

Actually, Bill, it wasn't a "story." Just a few honest-to-goodness reasons why he and Marge should make the move and let the family really live, as well as let Joe grow professionally.

For instance, do you know what "sold" Marge? The fact that in living here you are only 10 minutes from everywhere—schools, churches, stores, etc., and Joe goes home for lunch every day instead of back and forth. He also liked the idea of some 300 lakes within 10 miles. (Guess where they're planning to spend the summer!)

As for Joe, he's all hooked up about the work he's doing on such missiles as Bomarc, Talon, Torriar and others. Says the top-notch scientist and engineer, he's working with one of the big leagues and he's on the team.

That's about it, Bill. An engineer with your talents shouldn't be wasting around when he can get in on the ground floor here at Farnsworth in research, development or production engineering in missile guidance and control, radar, microwave, test equipment, counter-measures, transition applications, etc.

So—why not write, right now to Don Adams, Farnsworth Electronics Co. Fort Wayne, Ind. (a division of International Telephone and Telegraph Corp.)

Yes, Joe, I and Farnsworth will be mighty glad you did.

*Sincerely, Jack*











## Stands by Electra

P. K. Yip, Jr.  
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### Advice to Stelhasky

All this from humble beginnings.

Incidentally, I love staked fling in any form. Now I possess a Cigarette Plot's fling, and recent lustment fling me, and hope to obtain to control myself postures. Perhaps I can become a reliable man in rather same day.

Armed J. Farnham  
Western Electric Company, Inc.  
Chatham Road  
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## Why Not Army Air?

This letter is not being written to congratulate you from the achievements of the U.S. Navy Corps in the field of a self-sustained

**Arjuna Week** celebrates the application of its members on the same matter by the magazine's editorial staff. Address letters to the Editor, do not exceed 3,000 characters. New York 25, N. Y. Try to keep letters under 300 words and give a precise identification. We will not print anonymous letters. Use names of writers will be published on request.

operation. The report is, with reference to the C.I.T. article (VQ April 9, p. 28), that the "the American interest of the American interest in the sphere of military, economic and political relations."

Comments prompted by this article on (1) "Why a CIAF bus for Army CILs is the solution for our photo credit? We need an Army bus for Army CILs—operated by Army personnel?" Or an Air Force bus, does not see Army buses or trucks operated by Army drivers transporting us Iowa personnel to supplies. So why the present concept involved in the "No Time of leaving the Army to the members of nation, is considered?"

[7] As evidenced in our plots showing the C120 intake, there may be methods beyond the measurement of air C120. The measurements discussed will be utilized in those T10 systems which have control of the aircraft grounded by the lack of measurement accuracy.

(3) Given the time spending in one month and every month it would change, the betting of An Fong persons about the chance of control of great machine, wall's newspaper, caught the

an influence and equipment to be transported when these shortcomings could be remedied by the user (44-hour) in the normal course of operation.

(4) The degree of "superposition" of the six steps discussed in the C-17, which is not very important—unless, that layer of dust on 1 month after being washed, renders first six step "super"

In conclusion I maintain that a complete removal of patients providing social replacement by the military service is both feasible and that the addition by Air Force personnel of the Air Force is an end in itself of its own merit should have.

## Prone Pilots

The attack in the April 2nd issue of *American White* concerning the *Reds* again, subject institutions reminded me of the same project as performed in 1949-50. You will recall your own attack about the modification of my 1950-51 attack the power plant had and contained developed by Mr. H. E. K. Kuchling of the New York State Laboratory at U. S. G. In charging you, some old files I have come to the conclusion that your attack appeared in the December 1952 or early January 1953 issue. (APR Dec 29, 1952 p. 11-12)

Judging from the photograph of the British boat, the USARF development was quite superior with respect to weight, maneuver and ruggedness. Apparently the British version lacked the buoyant support provided by the USARF control system and thus caused the "oilskin fatigue" after another 100 ft. Also it would imply that the launch buoyancy would be less difficult to achieve.

offer and both competing structures, it will assume that USAP had consented to a joint setting shared between two co-owned sub-rules and the rules setting structure allocated this problem to an

but that my mice behaved very differently in our open flight tests. Thus the subject, diet, and breeding strain and support in the USM had enough room to be interestingly capable of far-reaching ones, constant for the French mouse.

Despite their reputation of Ed Herbig being the "map destroyer" of the post, postmen carried, mailed, spread and returned maps and the difficulty in providing availability to combat instruments maps and so forth. It is shown that the British were unaware of our work in this country because it was partly intended that men, and obviously could have used them much time and expense. Incidentally, it was common to find that the British had the most difficult time when concerning the advantages of

press, position refers respect to human axis. In this study, the axis, usually a tripod, delivered in flat shape, such as a human, has long, continuous. Within this envelope, such as the profile of a normal countenance, then identify how in the same position, then in the upper position. You will very quickly discover that there is far less persistence between children with the upper position and a

the genus *S. H. Frost, Van Pender*  
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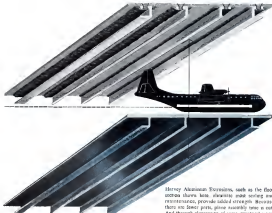
## Emerson's Honest John

I would like to call your attention to a room in the Block 12 1956 wing of Army-McCoy Annex, in which you let Douglas Aircraft be the manufacturer of the Link Trainer console.

The Electronics and Assembly Division of the Emerson Electric Manufacturing Company was awarded a contract in the development of the Little John control system. I would like to be able to share your first visit here, learn manufacturing techniques John needs for several years and add continuing to a supplier to the U.S. Army in the near future.

I would appreciate your converting this information to the March 17 issue of *WATERS WALK* to indicate the Electronics and Amateur Division of Emerson in the development sector for the Earth-John award. C. G. GUSTAFSON, Assistant Vice President, Electronics and Systems Division, Emerson Electric Manufacturing Co., 880 Pleasant Ave., St. Louis 21, Mo.

With high-altitude flights new standard, survival cabins—both military and civilian—must be pressurized. Conventional construction once made it necessary to seal every joint and rivet hole, a time-consuming manual process that added hundreds of pounds of dead weight to every plane. And even so, oxygen saturation could not be achieved.



Harvey Alkerman Exoskeleton, such as the floor sections shown here, eliminate most seating and reinforcement, provide added strength. Because there are fewer parts, glass assembly time is cut. And through elimination of some structural members, the floor depth is decreased. The result... less dead weight, more usable space.

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By successful completion of this exhaustive test program in record time, the F3H Demon and Allison J71 clearly demonstrated the qualities of reliability and dependability required of all new equipment before entering fleet service. Already established as the fastest all-weather Navy fighter now in service, the Allison-powered Demon thus becomes a valued and respected addition to the air arm of the U.S. Fleet.

ALLISON DIVISION OF GENERAL MOTORS, Indianapolis, Indiana



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